Oil and Gas Leasing Program

Final Environmental Impact Statement

May 1985

STATE OF WASHINGTON
DEPARTMENT OF
NATURAL RESOURCES
BRIAN BOYLE
COMMISSIONER OF PUBLIC LANDS
ART STEARNS — SUPERVISOR

This document is ((~~drafted~~)) prepared in compliance with the State Environmental Policy Act (Chapter 43.21C RCW); Revised SEPA Guidelines, effective April 4, 1984 (Chapter 197-11 WAC); Regulations of the Department of Natural Resources, effective October 4, 1984 (Chapter 332-41 WAC).

COVER MEMORANDUM

The Washington State Board of Natural Resources is considering adopting Goals and Policies and the Commissioner of the Department of Natural Resources is considering adopting the program to carry out these goals and policies for leasing of department-managed lands for oil and gas preliminary investigation and exploratory drilling.

The department is issuing the proposed Oil and Gas Leasing Program (OGLP) simultaneously with this Environmental Impact Statement on the OGLP. The two documents are meant to be read together to provide a complete understanding of the OGLP, alternatives and their impacts.

The Final Programmatic Environmental Impact Statement (((P))FEIS) discusses possible environmental impacts (with mitigative measures and alternatives) that could occur on department-managed lands as a result of activities ((~~proposed~~)) permitted in the Oil and Gas Leasing Program. Activities ((~~proposed~~)) will be influenced by the diversity of climate, topography, vegetation, soils and population density found on department-managed lands across the state.

This ((P))FEIS is prepared in accordance with the Washington State Environmental Policy Act of 1971 as amended by Chapter 43.21C RCW and rules promulgated by Chapter 197-11 WAC, effective April 4, 1984.

The department proposes to allow preliminary investigative and exploratory actions for oil and gas purposes on department-managed land. If exploratory drilling under a lease leads to a producing well, the department also proposes to allow development and production. The development and production phases shall require an environmental checklist and may require a site-specific supplemental environmental impact statement.

The department could choose to deny any or all exploration activities or refuse to lease department-managed lands for oil and gas purposes, but by so doing would be in conflict with department goals and basic trust responsibilities.

The ((P))FEIS is intended to serve as a baseline for evaluation of proposed oil and gas preliminary investigations and exploratory drilling activities only. The department is ((~~proposing~~)) adopting a phased review process which examines site-specific impacts associated with development and production when they occur. Since the location of potential wells is not known and some time may elapse between leasing and the development/production phases, these phases are not analyzed.

The ((P))FEIS does not cover activities on private or federal lands or state-owned lands managed by other agencies. It also does not address alternatives to or impacts of actions required by the Oil and Gas Conservation Act. Those regulations are administered as a separate entity by the department's Division of Geology and Earth Resources on behalf of the Oil and Gas Conservation Committee. All oil and gas related management activities on department-managed lands are subject to those regulations.

KEY ENVIRONMENTAL ISSUES

Key environmental issues associated with the proposed action were identified by department analysis and the scoping process. Those issues are listed according to frequency of response to the scoping notice. The page numbers on which a discussion may be found ((~~is also~~)) are listed below.

- Disruption of fish and wildlife habitat.
  Pages 44, 51, 52, 54, 55, 59, 63, 67, 72, 76

- Impacts to threatened or endangered plant and animal species.
  Pages 39, 40, 55, 59, 63, 76, 81

- Altered movement or degraded quality of surface water.
  Pages 43, 71, 76, 80

- Altered movement or degraded quality of ground water.
  Pages 63, 71, 81

- Noise.
  Pages 44, 64, 67, 72, 76, 82, 84

- Generation and disposal of solid and liquid wastes.
  Pages 45, 47, 65, 71, 79, 80, 81, 85

- Release of poisonous or hazardous substances.
  Pages 72, 74, 82

- Impacts to unstable soils and steep slopes.
  Pages 43, 58

- Increase in erosion due to construction and clearing.
  Pages 43, 75

- Decrease in air quality due to increased particulates or fumes.
  Pages 43, 63, 64, 75, 79

- Degradation of public drinking water sources.
  Pages 35, 63, 71, 72

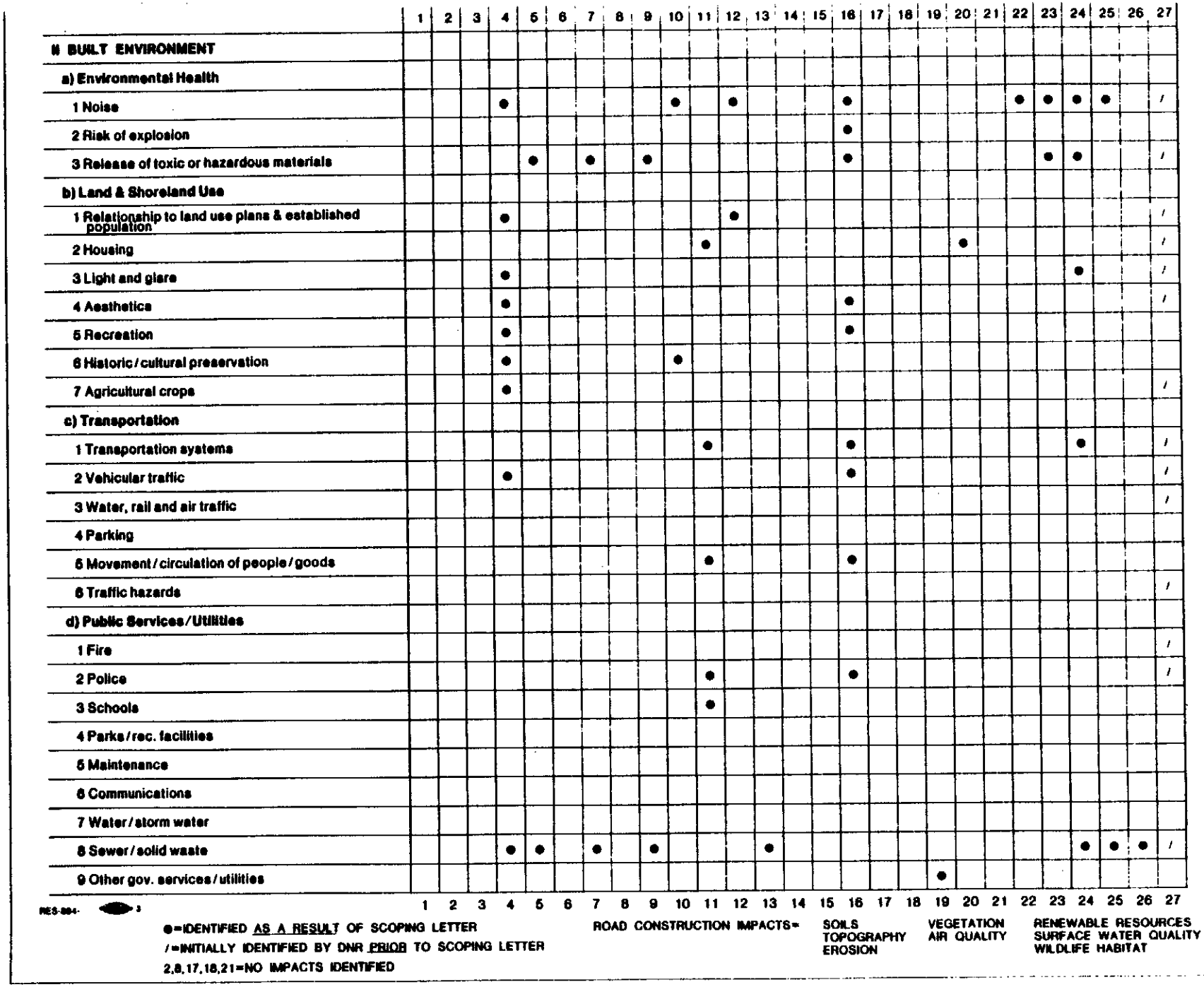
- Increased road maintenance as a result of increased vehicular use.
  Pages 45, 60

Key Environmental Issues by Respondent

ELEMENTS OF THE ENVIRONMENT

(WAC 197-11-444)

I. NATURAL ENVIRONMENT	1 City of Tacoma	2 Grant Valentine	3 Colville National Forest	4 Whatcom County	5 Squaxin Island Tribe	6 Dept. Social and Health	7 Muckleshoot Tribe	8 Parks & Recreation	9 Stillaguamish Tribe	10 Olympic Nat'l Park	11 Jefferson Co. Planning Dept.	12 Cowlitz County	13 Frank Hoffman	14 Jamison, Marine Land Mgmt.	15 NW Indian Fisheries Commission	16 Snoh. Co. Planning & Comm. Dev.	17 Weyco	18 Amoco Production	19 Snohomish Co. P.U.D.	20 Okanogan Nat'l Forest	21 Chelan Co. P.U.D.	22 King Co. Planning Dept.	23 City of Everett	24 Dept. of Transportation	25 Dept. of Ecology	26 Dept. of Game	27 Identified by DNR
a) Earth																											
1 Geology				●																							/
2 Soils			●	●					●							●							●			●	/
3 Topography			●	●												●											/
4 Unique physical features				●																							
5 Erosion/accretion			●	●	●				●				●			●											/
b) Air																											
1 Air quality			●	●						●						●								●			/
2 Odor																●											/
3 Climate																											
c) Water																											
1 Surface and movement/quantity/quality			●	●	●	●			●			●				●										●	/
2 Runoff/absorption				●					●							●									●	●	/
3 Floods																											
4 Ground H_2O movement/quantity/quality				●	●	●	●		●							●									●	●	/
5 Public water supplies	●					●							●										●				
d) Plants & Animals																											
1 Habitat, numbers, diversity of plants, fish or wildlife			●	●	●		●		●	●			●	●	●	●										●	/
2 Unique species				●						●						●											
3 Fish/wildlife migration routes			●	●	●		●		●	●			●		●	●											
e) Energy & Natural Resources																											
1 Amount req./rate of use/efficiency																●											/
2 Source/availability																				●							
3 Nonrenewable resources																											/
4 Conservation/renewable resources			●																								
5 Scenic resources																●											


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
II BUILT ENVIRONMENT
a) Environmental Health
1 Noise
2 Risk of explosion
3 Release of toxic or hazardous materials
b) Land & Shoreland Use
1 Relationship to land use plans & established population
2 Housing
3 Light and glare
4 Aesthetics
5 Recreation
6 Historic/cultural preservation
7 Agricultural crops
c) Transportation
1 Transportation systems
2 Vehicular traffic
3 Water, rail and air traffic
4 Parking
5 Movement/circulation of people/goods
6 Traffic hazards
d) Public Services/Utilities
1 Fire
2 Police
3 Schools
4 Parks/rec. facilities
5 Maintenance
6 Communications
7 Water/storm water
8 Sewer/solid waste
9 Other gov. services/utilities
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
RES-884-
●=IDENTIFIED AS A RESULT OF SCOPING LETTER
/=INITIALLY IDENTIFIED BY DNR PRIOR TO SCOPING LETTER
2,8,17,18,21=NO IMPACTS IDENTIFIED
ROAD CONSTRUCTION IMPACTS=
SOILS
TOPOGRAPHY
EROSION
VEGETATION
AIR QUALITY
RENEWABLE RESOURCES
SURFACE WATER QUALITY
WILDLIFE HABITAT

FACT SHEET

Action Sponsor:	The Washington State Department of Natural Resources
Proposed Action:	Leasing of department-managed lands for oil and gas preliminary investigation and exploratory drilling.
Project Location:	Statewide
Responsible Official and Contact Person:	Kenneth E. Solt, Division Manager Lands Division Mail Stop QW-21 Department of Natural Resources Olympia, WA 98504 (206) 753-2989
Prepared By:	Donald M. Ford and Ellis R. Vonheeder
Contributing Editor:	Ellen Ellis

Note: An oil and gas lease is obtained by public auction for department-managed lands. Listed permits and approvals may be required to conduct preliminary investigation and exploratory drilling.

Activities may require the following permits and approvals.

Oil and Gas Lease	Department of Natural Resources
Seismic Exploration Permit:	Oil and Gas Conservation Committee
Oil and Gas Drilling Permit:	Oil and Gas Conservation Committee
Right of Entry Permit:	Department of Natural Resources
Zone Changes and Local Permits:	Appropriate County/City Planning or Building Offices

Permits for Access On/Off County Roads:	Appropriate County Offices
Shoreline Management Permits:	Appropriate County Planning Office
Water Removal Permits:	Department of Ecology
Hydraulic Project Approval:	Departments of Fisheries and Game
Solid Waste Disposal:	Appropriate County Health District Office
Sanitary Waste Disposal:	Appropriate County Health District Office
Compliance with the Forest Practices Act:	Department of Natural Resources Division of Private Forestry and Recreation
Compliance with State Dangerous Waste Regulations:	Department of Ecology Regional Office
Compliance with State Noise Standards:	Department of Ecology Regional Office
Consultation Regarding Archaeological/ Historical Resources:	Office of Archaeology and Historic Preservation and Washington Archaeological Research Center
Consultation Regarding Endangered Species:	Department of Natural Resources Natural Heritage Program and Department of Game Nongame Program
Consultation Regarding Wildlife Resources:	Department of Game
Location of EIS Background:	Washington Department of Natural Resources Lands Division Room 202 Public Lands Building 14th and Water Street Olympia, Washington 98504
Cost to ((P))purchase ((G))copy of this ((P))FEIS:	((~~$5.00 per set~~)) Initial copies are available from the Department at no cost. Additional copies are available for $6.00 per set.
Date of Issue of ((P))FEIS:	((~~November 26, 1984~~)) May 22, 1985
((~~Closing Date for Public Comments~~))	((~~January 15, 1985~~))

WAC 197-11-960 Adoption notice.

ADOPTION OF EXISTING ENVIRONMENTAL DOCUMENT

Adoption for (check appropriate box) ☐ DNS ☒ EIS ☐ other _____

Description of current proposal Programmatic EIS, Oil and Gas Lease Program

Proponent Department of Natural Resources (DNR)

Location of current proposal Department managed lands, statewide

Title of document being adopted State of Washington Natural Heritage Program

Agency that prepared document being adopted DNR

Date adopted document was prepared 1983

Description of document (or portion) being adopted Describes Natural Heritage Plan and methods of preservation, and lists of priorities for rare plants, animals, etc.

If the document being adopted has been challenged (197-11-630), please describe:

The document is available to be read at (place/time) Department of Natural Resources, Room 201, Public Lands Building, 14th & Water Street, Olympia,WA 8 A.M. - 5 P.M., Monday-Friday

We have identified and adopted this document as being appropriate for this proposal after independent review. The document meets our environmental review needs for the current proposal and will accompany the proposal to the decisionmaker.

Name of agency adopting document Department of Natural Resources

Contact person, if other than responsible official _____ Phone _____

Responsible official Kenneth E. Solt

Position/title Manager, Lands Division Phone 753-2989

Address Room 202, Public Lands Building, Olympia,WA 98504

Date 10/22/84 Signature Kenneth E. Solt

WAC 197-11-960 Adoption notice.

ADOPTION OF EXISTING ENVIRONMENTAL DOCUMENT

Adoption for (check appropriate box) ☐ DNS ☒ EIS ☐ other _____

Description of current proposal Programmatic EIS, Oil and Gas Lease Program

Proponent Department of Natural Resources (DNR)

Location of current proposal Department -managed lands, statewide

Title of document being adopted Forest Land Management Program EIS

Agency that prepared document being adopted DNR

Date adopted document was prepared November 1983

Description of document (or portion) being adopted Heritage Protection-Endangered, Threatened and Sensitive Species, Natural Area Preserves/Registry Program, and Cultural Resources, and the Existing Environmental Conditions.

If the document being adopted has been challenged (197-11-630), please describe:

The document is available to be read at (place/time) Department of Natural Resources, Room 201, Public Lands Building, 14th & Water Street, Olympia, WA 8 A.M.-5 P.M., Monday-Friday

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Contact person, if other than responsible official _____ Phone _____

Responsible official Kenneth E. Solt

Position/title Manager Lands Division Phone 753-2989

Address Room 202, Public Lands Building, 14th and Water Street, Olympia 98504

Date 10/22/84 Signature Kenneth E. Solt

TABLE OF CONTENTS

DISTRIBUTION LIST

FEDERAL AGENCIES

U.S. Forest Service
- Colville National Forest
- Gifford Pinchot National Forest
- Mt. Baker-Snoqualmie National Forest
- Okanogan National Forest
- Olympic National Forest
- Wenatchee National Forest

U.S. Bureau of Indian Affairs

U.S. Bureau of Land Management

U.S. Fish and Wildlife Service

U.S. National Park Service
- Olympic National Park
- Rainier National Park
- North Cascades National Park

WASHINGTON STATE GOVERNMENTAL AGENCIES

Department of Ecology

Department of Fisheries

Department of Game

Department of Social and Health Services

Department of Transportation

Office of Archaeology and Historic Preservation

Parks and Recreation Commission

Washington State Conservation Commission

Washington State Energy Office

COUNTY PLANNING COMMISSIONS

Adams

Asotin

Benton

Chelan

Clallam

Clark

Columbia

Cowlitz-Wahkiakum

Ferry

Franklin

Grant

Grays Harbor

Island

Jefferson

King

Kitsap

Kittitas

Klickitat

Lewis

Lincoln

Okanogan

Pacific

Pend Orielle

Pierce

San Juan

Skagit

Skamania

Snohomish

Spokane

Stevens

Thurston

Whatcom

Yakima

CITIES AND TOWNS

Buckley

Carnation

Centralia

Eatonville

Everett

North Bend

Richland

Seattle

Snohomish

Sultan

Tacoma

PUBLIC UTILITY DISTRICTS

Chelan County

Snohomish County

INDIAN TRIBES AND ASSOCIATIONS

Chehalis Business Council

Colville Business Council

Hoh Tribal Business Committee

Jamestown Clallam Indian Tribe

Kalispel Business Committee

Lower Elwha Tribal Council

Lummi Business Council

Makah Tribal Council

Muckleshoot Tribal Council

Nisqually Indian Community

Nooksack Indian Tribal Council

Northwest Indian Fisheries Commission

Port Gamble Business Committee

Puyallup Tribal Council

Quileute Tribal Council

Quinault Business Committee

Sauk-Suiattle Indian Tribal Council

Shoalwater Bay Tribal Council

Skokomish Tribal Council

Spokane Business Council

Squaxin Island Tribal Council

Stillaguamish Board of Directors

Suquamish Tribal Council

Tulalip Board of Directors

Upper Skagit Tribal Council

Yakima Tribal Council

STATE UNIVERSITY GEOLOGY DEPARTMENTS

Central Washington University

Eastern Washington University

University of Washington

Washington State University

Western Washington University

SCHOOL DISTRICT

Sultan School District 311

HEALTH DISTRICT

Snohomish Health District

DEPOSITORY LIBRARIES OF WASHINGTON

Aberdeen Public Library

Anacortes Public Library

Asotin County Library

Auburn Public Library

Bellingham Public Library

Burlington Public Library

Camas Public Library

Central Washington University

Clark College

Eastern Washington University Library

Everett Public Library

Fort Vancouver Regional Library

Gonzaga University

King County Library System

King County Municipal Reference Library

Kitsap Regional Library

Longview Public Library

Mid-Columbia Regional Library

Moses Lake Public Library

Mount Vernon Public Library

North Olympic Library System

Pacific Lutheran University

Pasco Public Library

Pierce County Library

Port Townsend Public Library

Prosser Public Library

Puyallup Public Libary

Renton Public Library

Richland Public Library

Seattle Pacific University

Seattle Public Library

Shelton Public Library

Spokane County Library

Spokane Public Library

Tacoma Public Library

Timberland Regional Library

U.S. Department of Energy - Law Library, Richland

University of Puget Sound

University of Washington

Walla Walla Public Library

Washington State University

Wenatchee Public Library

Western Washington University

Whitman College

Yakima Valley Regional Library

ORGANIZATIONS

Association of Washington Businesses

Association of Washington Cities

Black Hills Audubon Society

Evergreen Audubon Society

Friends of the Columbia

Hood Canal Environmental Council

League of Women Voters

Nature Conservancy

Northwest Association of Petroleum Landmen

Northwest Steelhead Salmon Council

Olympic Peninsula Audubon Society

Pilchuck Audubon Society

Seattle Audubon Society

Sierra Club

Washington Association of Counties

Washington Cattlemen's Association

Washington Environmental Council

Washington Forest Protection Association

Washington Independent Petroleum Royalty Owners

Washington Sportsmen's Council

Washington Wheatgrowers Association

Willapa Hills Audubon Society

OIL AND GAS TRADE ASSOCIATIONS

Western Oil and Gas Association

COMPANIES

American Hunter Exploration

Anschutz Corp.

Arco Corporation

Boise Cascade Corp.

Champlin Petroleum

Chevron USA

Conoco Inc.

Crown-Zellerbach

Diamond Shamrock Corp.

Exxon Corp.

Garth Tallman and Assoc.

Georgia Pacific

Getty Oil Co.

Gulf Oil Corp.

Howell Energy

ITT Rayonier

Knight Royalty Corp.

Lewis County Timber Co.

Longview Fibre Corp.

Marathon Oil Co.

May Petroleum Inc.

Meridian Land and Mineral Co.

Mobil Oil Corp.

Port Gamble Co.

Rex Randolph

St. Regis Co.

Scott Paper Co.

Shell Oil Co.

Simpson Timber

Sohio Petroleum

Union Oil Co.

Voyager Petroleum

Weyerhaeuser Co.

OIL AND GAS LESSEES

Amoco Production

Artamus

Chaparral

William Corry

Emefco Petroleum

Jerry Ryan and Co.

Junico Corp.

Love Oil Co.

Martin Wilson and Assoc.

Milestone Petroleum

Steve Saban

Say Energy Inc.

Texaco Corp.

Nathan Thomas

Kirk Tracy

Trinity Resources

INDIVIDUALS

David Clark

Don Lee Fraser

Marshall T. Hunting

Dan Mathias

Darrell Williams

John DeYonge

LIST OF FIGURES AND TABLES

BACKGROUND

State trust lands have been leased for oil and gas exploration since the early 1900s. Over the years, interest has fluctuated. In early years, neither the private nor governmental sector had any concerns other than leasing a tract of land and receiving the appropriate rentals. As time passed, concern was expressed about the impact of underground drilling and the depletion of oil and gas reserves by too much drilling. Legislation was passed in 1951 establishing the Oil and Gas Conservation Committee (Chapter 78.52 RCW) to issue permits and regulate drilling for oil and gas.

In 1971 the State Environmental Protection Act (SEPA) (Chapter 43.21C RCW) was enacted to bring into focus the environmental impacts that activities could have on the environment of the state of Washington.

Leasing of state trust lands for oil and gas exploration was subject to SEPA compliance. Individual lease applications were not investigated as to their potential impact on the environment but an overall checklist was prepared for the act of leasing. Environmental issues were investigated when permits were acquired from the Oil and Gas Conservation Committee for exploration drilling or shot-hole seismic surveys. The lease required the lessee to comply with the permit. During leasing activities in 1979, concerns were raised about the relationship of oil and gas leasing and exploration to the environment.

In 1981 and 1982 several hundred applications to lease for oil and gas exploration were received by the department. In response to concerns raised at meetings with state agencies and four public meetings, an environmental checklist was required for each lease application. The department then divided lease applications into three categories, depending upon their relationship to environmental issues. The categories were: (1) normal leasing, (2) restricted leasing and (3) withdrawn from leasing because of either law or policy decision by the Commissioner in areas that are being extensively studied for management issues. A public auction was held April, 1984, using the category system.

Prior to the auction, the complex process of determining category placement, and the concerns expressed in public meetings caused the department to begin preparation of a program and a programmatic environmental impact statement for oil and gas seismic exploration and exploratory drilling. All April, 1984, leases contained a provision that those activities would not be allowed until completion of the program and environmental impact statement.

During the development of the program and the environmental analysis, the scope was expanded to include all preliminary investigative activities. The department's goal is to make department-managed lands available for leasing, and through this ((P))FEIS identify and describe the environmental issues and propose mitigation measures necessary to alleviate harmful environmental impacts.

SCOPING

SEPA guidelines (WAC 197-11-408) direct a lead agency to narrow the scope of an EIS to probable significant adverse impacts and reasonable alternatives, including mitigation measures.

Through circulation of a Scoping Notice dated June 6, 1984, the department proposed a programmatic EIS (PEIS) to cover oil and gas leasing, explosive seismic exploration and exploratory drilling on department-managed lands. Included with this notice was a Determination of Significance with a listing of areas of concern previously identified.

A copy of the Scoping Notice and an environmental checklist were available during the 21-day comment period which began June 8, 1984. The department received 26 responses from agencies, tribes and the private sector. A summary of the major areas of concern indicated in the comments and addressed in the PEIS follows.

NATURAL ENVIRONMENT

Earth

- Steep slopes
- Unsuitable soils
- Compaction of soils
- Erosion increase due to road construction

Air

- Decrease in air quality from increased particulates or fumes.

Water

- Altered movement and degraded quality of surface waters
- Increased runoff of surface waters
- Altered movement and degraded quality of ground water
- Degradation of public drinking water supplies

Plants and Animals

- Degradation of fish and wildlife habitat
- Impacts to breeding, nesting, calving, wintering or spawning areas

- Impacts to threatened or endangered species of plants and animals

Energy and Natural Resources

- Storage of chemicals and fuels
- Amounts of fuel required to sustain exploration operation
- Impacts and damage to forested areas

BUILT ENVIRONMENT

Environmental Health

- Noise
- Possible spills and explosions
- Possible release of poisonous or hazardous substances

Land and Shoreline Use

- Impacts to wetland, riparian areas and floodplains
- Increased population
- Increased housing requirements
- Light and glare from artificial light sources
- Aesthetics
- Preservation of historically or culturally significant areas
- Removal of agricultural cropland from production

Transportation

- Increased road maintenance
- Increased vehicular traffic

Public Services and Utilities

- Increased police protection
- Impacts to parks and recreation areas
- Disposal of solid and liquid wastes

SUMMARY

PHASED ENVIRONMENTAL REVIEW

Oil and gas leasing is a nondirected action in that the leasing phase does not necessarily mean that exploration, development and production phases will occur or will follow one another in quick succession. When and where drilling will occur is unknown; thus, considerable time may elapse between phases under an oil and gas program. The department thus adopts a phased environmental review for its oil and gas leasing program to allow timely and site-specific evaluation of later exploration, development and production phases.

A preliminary investigation phase can occur prior to the leasing phase. Drilling permits from the Oil and Gas Conservation Committee are required and such permits will only be issued following SEPA compliance.

Following leasing and prior to commencing exploration, development and production activities, the lessee is required to provide a Plan of Operations to the department (WAC 332-18-360). An environmental checklist accompanies the Plan of Operations. Acting as lead agency, the department makes a Determination of Significance or Nonsignificance in accordance with SEPA. If a Determination of Significance is made, an EIS or Supplemental EIS (SEIS) will be required. [W11]

THE PROPOSED ACTION

The Washington State Board of Natural Resources is considering adopting Goals and Policies and the Commissioner of the Department of Natural Resources is considering adopting the program to carry out these goals and policies for leasing of department-managed lands for oil and gas preliminary investigation and exploratory drilling.

The Department of Natural Resources is authorized to allow oil and gas exploration, development and production on department-managed lands and has been given management responsibilities for these activities. Under the Oil and Gas Leasing Program (OGLP) the department proposes to allow preliminary investigative and exploratory actions for oil and gas purposes on department-managed land. If exploratory drilling under a lease leads to a producing well, it also proposes to allow development and production. The development and production phases shall require an environmental checklist and may require a site-specific supplemental environmental impact statement.

Under the OGLP, the department has the general authority to allow prelease activities, accept or reject lease applications, auction leases, monitor lessee activities and provide information to the public on oil and gas leasing activity. Actual on-the-ground operations are accomplished by the lessee. The deparment may ultimately condition or deny any or all of the actions through policies, laws, permits and lease conditions. Further, the department may condition or deny any or all of the actions, including leasing, based upon environmental factors.

This Final Programmatic Environmental Impact Statement (((P))FEIS) forms a baseline for evaluating proposed major actions related to oil and gas activities. The ((proposed)) actions are listed in the order in which they appear in the ((P))FEIS. They are:

- Lands Available for Lease
- Leasing of Aquatic Lands
- Water and Wetland Areas
- Department-Initiated Oil and Gas Lease Applications
- Notification of Oil and Gas Leasing

- Plan of Operations
- Right of Entry
- Seismic Exploration Permits
- Resource Protection
- Road Construction
- Preliminary Investigations
- Seismic Exploration
- Stratigraphic and Exploratory Drilling

The details of the OGLP are contained in the accompanying program document. The reader should reference both documents concurrently to gain a comprehensive description of the program.

OVERALL MANAGEMENT DIRECTION

The department believes that coordinated planning between management programs can provide income to the state and the trusts from a variety of activities, yet maintain a healthy natural environment for present and future generations.

((~~During the last year~~)) In 1984, the department adopted a management plan for department-managed forest lands and issued a proposed policy plan for aquatic lands. Since the Oil and Gas Leasing Program affects both forest and aquatic lands, the goals of their management plans are repeated here. The Oil and Gas Leasing Program goals further define forest and aquatic land management.

FOREST LAND MANAGEMENT GOALS

Conserve and enhance the natural resources of state forest land.

- Provide a sustained yield of timber through intensive forest management.
- Integrate the needs of nontimber resources into the management of the timber resource.
- Protect from major losses, such as those caused by fires, insects, animals and diseases.

Provide financial support that balances the level and flow of revenue to the trusts.

- Provide for both the short-term and long-term needs of the trusts.
- Diversify management practices to moderate economic risks.
- Anticipate and respond to market opportunities.

Provide social and economic benefits.

- Provide for multiple use on forest land.
- Contribute to the viability of the forest products industry.
- Contribute to state energy production.

AQUATIC LAND MANAGEMENT GOALS

Conserve and enhance aquatic lands and associated resources.

- Meet or exceed environmental quality standards.
- Maintain or improve the productivity and usefulness of aquatic lands.
- Provide high quality habitat for wildlife on state aquatic lands.

Provide social and economic benefits.

- Promote access to and recreational use of state aquatic lands.
- Encourage water dependent uses.
- Promote the production on a continuing basis of renewable resources.
- Allow suitable state aquatic lands to be used for energy and mineral production.
- Generate income from use of aquatic lands.

OIL AND GAS LEASING PROGRAM GOALS

- Conserve and enhance the natural resources of state lands. [W1]

  Integrate oil and gas resource management with the management of other state land resources.

  Protect from and reduce or eliminate losses caused by erosion, pollution of ground and surface waters and disruption of wildlife habitats.

- Provide financial support.

  Provide a financial yield from oil and gas activities through lawful land management.

  Provide for both the short-term and long-term needs of the trusts and the public.

  Anticipate and respond to varying levels of oil and gas industry activities.

  Integrate land uses to moderate economic risks.

- Provide social and economic benefits.

  Provide for multiple use on state lands.

  Contribute to the potential of the oil and gas industry.

  Contribute to state energy production potential.

POLICIES

Most department policies and procedures for the Oil and Gas Leasing Program are required by statute -- some developed by other agencies or committees. Those policies will be listed and the governing statute stated. Others, although required by statute, give the department the latitude to do more than the law requires. In those cases alternatives will be discussed.

LANDS AVAILABLE FOR LEASE

Proposed Action: [W11]

All department-managed lands are available for oil and gas leasing, exploration, development and production unless prohibited or restricted by law, regulation or Commissioner's order.

Alternatives:

1. Department-managed lands will not be leased for oil and gas activities. (No Action)

2. Department-managed lands will be placed in one of three categories after an application is received. Oil and gas leasing will be based on each tract's category. The categories are:

   - Category I. Lands Available for Normal Leasing -- Tracts on which no significant environmental impacts will occur.

   - Category II. Land Available for Restricted Leasing -- Tracts on which there is a potential for significant environmental impact.

   - Category III. Lands Withheld from Leasing -- Tracts in this category will be withheld from leasing until an EIS has been completed and appropriate mitigation measures determined.

3. Department-managed lands will be placed in one of two categories. Oil and gas leasing will be based on each tract's category. The categories are:

   - Category I. Lands Available for Normal Leasing -- Leases will be issued with site-specific conditions.

   - Category II. Lands Withheld from Leasing -- Tracts in this category will be withheld from leasing until an EIS has been completed and appropriate mitigation measures determined.

Discussion:

In June of 1983, the department began review of its oil and gas leasing program to answer concerns about environmental impacts. At that time it was proposed to develop a "category" system and classify lands at the time of application. The department selected a "three-category" system (Alternative 2) based on degree of sensitivity. A "two-category" system (Alternative 3) was also considered and rejected as not differing enough from the previous leasing practice to justify the added administrative expense.

Alternative 1, the no-action alternative, negates the trust mandate and therefore is not a viable alternative.

The three-category system (Alternative 2) is being used by the department until review and adoption of this PEIS are completed. Its continued use is hampered because the definitions used are difficult to apply consistently to lands across the entire state. Alternative 3 has the same difficulty.

The proposed action allows an interested party to apply to lease any department-managed land (with the stated exception). However, allowing leasing of an area does not mean that activities will occur. In fact, more often than not, lands are leased and no activity occurs beyond some preliminary investigation using existing roads. Any proposed activities requiring a Plan of Operations or an Oil and Gas permit issued by the Oil and Gas Conservation Committee must have an applicant-developed environmental checklist and Plan of Operations approved and the required permit before work begins. See threshold determination,

The proposed action provides for environmental protection but allows the department the flexibility to adjust to changing conditions. The SEPA process (which could include supplemental environmental impact statements), Natural Heritage Program and OAHP recommendations must be followed.

LEASING OF AQUATIC LANDS

Proposed Action:

The department is currently withholding department-managed marine and estuarine aquatic lands from lease. These include lands under the Pacific Ocean out to three miles, Puget Sound, the Strait of Juan de Fuca, the Strait of Georgia, Grays Harbor, Willapa Bay, and the Columbia River upstream to Puget Island. A future decision to allow leasing and exploratory drilling will be made only after completion of a future Environmental Impact Statement and a determination by the Commissioner of Public Lands that the activity would be in the public interest. Surface drilling is prohibited by law in and within 1,000 feet of Puget Sound and the Strait of Juan de Fuca (RCW 90.58.160).

Alternative:

There are no alternatives that would further reduce environmental impacts and still comply with the department's proposed Aquatic Land Policy Plan goal to "Allow suitable state aquatic lands to be used for energy and mineral production".

Discussion:

No discussion is needed since any alternative would have greater environmental impact.

Proposed Action:

The department will permit oil and gas leasing of department-managed lands under fresh water. Surface drilling is prohibited on these lands. Directional drilling is permitted beyond 200 feet of the ordinary high water mark and as otherwise permitted by law.

Alternative:

Leasing of department-managed lands under fresh water will be prohibited. (No Action)

Discussion:

The no-action alternative is needlessly restrictive and removes many areas of the state from potential production. Prohibiting surface drilling and imposing limitations on directional drilling (the proposed action) will provide protection from adverse impacts but still allow production.

WATER AND WETLAND AREAS

Proposed Action:

Oil and gas seismic surveys, drilling, development and production will be prohibited within 200 feet of any Type 1, 2, 3, or 4 waters and wetlands of the state (WAC 222-16-020, -030 and WAC 344-12-040).

Alternatives:

1. Oil and gas seismic surveys, drilling, development and production will be prohibited within 100 feet of any Type 1 and 2 and 50 feet of any Type 3 and 4 waters and wetlands of the state.

2. Oil and gas activities near, under or on any water or wetlands of the state will be unrestricted unless otherwise restricted by law.

Discussion:

Of the alternatives, the proposed action provides the best level of environmental protection for riparian areas and habitats. A buffer strip of 200 feet reduces the possibility of serious pollution and sedimentation problems due to oil and gas activities adjacent to water bodies and riparian zones. The 200 feet is consistent with the definition of "Wetlands," or "Wetland Areas" (WAC 344-12-040.)

Alternative 1 provides a measure of protection to water and wetland areas. The use of the distance limitation -- 100 feet in Type 1 and 2 and 50 feet in Type 3 and 4 waters and wetlands could cause confusion in administration and enforcement due to the need to identify the water type before operations may begin. The reduced distances do not, in the opinion of the department, provide a sufficient safety margin in the event of a fuel or chemical spill.

Alternative 2 provides unsatisfactory protection to water and wetland areas since current laws concentrate on tidal waters.

DEPARTMENT-INITIATED OIL AND GAS LEASE APPLICATIONS

Proposed Action:

The department may initiate oil and gas lease applications in the name of the state when it appears the state may benefit.

Alternatives:

1. The department will not initiate oil and gas lease applications. (No Action)

2. The department will initiate oil and gas lease applications in areas considered geologically favorable.

Discussion:

Under the proposed action such leases offered would still be subject to the same evaluation considerations and conditions as a lease applied for by any other person. In the event no bid was submitted the lease would not be granted.

Alternative 1 removes the possibility of blocking up areas or initiating consideration of lands potentially favorable for oil and gas production.

Alternative 2 would allow the department to initiate oil and gas lease applications only when favorable geologic formations have been located. Such a role would require the department to take a much more active role in investigation and exploration.

NOTIFICATION OF OIL AND GAS LEASING

Proposed Action:

Written ((N))notification of impending oil and gas leasing will be provided by the department to surface owners of record upon acceptance of oil and gas lease applications in the following situations:

- Severed mineral rights (surface rights have been relinquished by the state) and
- Surface leased by other public agencies. [W1]

Alternatives:

1. Notification of impending oil and gas leasing will be provided by the department to surface owners of record upon receipt of oil and gas lease applications in the following situations:
   - Severed mineral rights (surface rights have been relinquished by the state) and
   - Surface leased by other public agencies.
2. Notification of impending oil and gas leasing will be provided by the department to surface owners of record when surface operations begin in the following situations:
   - Severed mineral rights (surface rights have been relinquished by the state) and
   - Surface leased by other public agencies.

Discussion:

The proposed action provides notification in a timely manner without creating needless paper work and concern.

Notification upon receipt of the application (Alternative 1) is too early in the process to serve any useful purpose. Many applications are rejected because of obvious environmental or operational problems. An additional round of notification would be needed to inform owners of record that the application was rejected.

On the other hand, waiting to do the notification until surface operations begin (Alternative 2) takes away the public's opportunity to be involved in early environmental analysis. Owners of record are often aware of sensitivities not identified by the department.

Once the department determined when the notification should occur, the question of whom to notify surfaced. Another set of alternatives was developed.

Restating the proposed action:

Notification of impending oil and gas leasing will be provided by the department to surface owners of record upon acceptance of oil and gas lease applications in the following situations:

- Severed mineral rights (surface rights have been relinquished by the state) and
- Surface leased by other public agencies.

Alternatives:

1. Only other state agencies owning or leasing surface rights will be notified of impending oil and gas leasing upon receipt of oil and gas lease application. (WAC 332-12-265.) (No Action)

2. Notification of impending oil and gas leasing will be provided to all surface owners of record upon receipt of oil and gas lease applications.

3. Notification of impending oil and gas leasing will be provided to surface owners of record and existing surface users of record.

Discussion:

The proposed action provides notification to those least likely to be initially informed by other means. Landowners and leaseholders are notified prior to entry. Alternative 1 overlooks others with an interest in the program's activities. Alternative 2 limits notification to surface owners. Alternative 3 is not possible within a reasonable time because of the research needed to determine the current owners and users.

PLAN OF OPERATIONS

Proposed Action:

A Plan of Operations describing intended activities and measures to mitigate environmental impacts must be submitted to and approved by the department prior to entry and initiation of surface operations. The Plan of Operations must be approved before permits will be issued by the department or the Oil and Gas Conservation Committee.

Alternative:

The proposed action is required by WAC 332-12-360. Alternatives that go beyond the proposed action would not increase environmental protection.

RIGHT OF ENTRY

Proposed Action:

An operator must obtain a Right of Entry permit from the appropriate ((DNR)) department Area ((Θ))office to conduct surveys on department-managed land. The operator must also contact the appropriate department Area office prior to entry upon the land.

A Right of Entry permit is not required to conduct surveys on department-managed land under an oil and gas lease provided the lessee of such land is contracting for or conducting the survey.

Alternative:

A no-action alternative would ignore the rights of surface lessees and surface owners of record and is thus considered unreasonable.

SEISMIC EXPLORATION PERMITS

Proposed Action:

Shot-hole seismic exploration requires a permit issued by the Oil and Gas Conservation Committee (WAC 344-12-050).

Alternatives:

1. The proposed action is required by WAC 344-12-050, thus a no permit (no action) alternative is not viable.

2. A lease will be required to conduct seismic exploration.

Discussion:

To obtain the permit required by WAC 344-12-050 the operator must submit a completed environmental checklist. The permitting process ensures early identification of possible areas of concern and incorporation of appropriate mitigation measures in the operator's Plan of Operations.

Alternative 2 would require a lease for seismic exploration. A lease does not add any environmental protection measures not required by the Oil and Gas Conservation Committee for the permit. This option would mean that completion of short-term exploratory activities could be delayed until an oil and gas auction was held.

The proposed action allows exploration of potential oil and gas producing areas without needless delays and expense while still providing necessary environmental protection measures.

RESOURCE PROTECTION[1]

PLANTS AND ANIMALS

Proposed Action:

Avoid impacts on plant and animal species considered endangered in Washington. Within trust management obligations, avoid impacts on species considered threatened, and consider avoiding or lessening impacts on species considered sensitive.

Alternatives:

1. Provide only the protection for endangered, threatened and sensitive species that federal law requires; or

2. Avoid impacts to all endangered, threatened and sensitive species.

Discussion:

The proposed protection will help prevent extinction or extirpation of endangered species. Considering sensitive species during the oil and gas leasing process protects many habitats or populations that might otherwise be lost because of the operator's or lessee's lack of information.

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1 These policies and alternatives parallel those adopted by the Board of Natural Resources for the Forest Land Management Program.

Protection provided by federal law (Alternative 1) is very limited. At present, no no plants and few animals that might live on department-managed land are listed on federal lists as endangered or threatened.

A program based on avoiding impacts on all endangered, threatened and sensitive species (Alternative 2) would prevent additional species from becoming endangered and would enhance plant and animal diversity, but it would be costly. Inventory and data gathering would have to be stepped up dramatically.

It is possible that no oil and gas activity could take place until an intensive on-site survey was done. The land use restrictions imposed by this option may not be warranted, since only ((one)) three endangered and seven threatened plant species and two endangered animal species on Washington state lists are found on department-managed land as of ((October, 1984)) January 1985.

NATURAL AREA PRESERVES AND THE REGISTRY PROGRAM

Proposed Action:

Preserve plant and animal diversity by designating certain parcels of state land under the Registry Program and in Natural Area Preserves.

Alternatives:

1. Do not use the Registry Program (No Action)

2. Encourage but do not require use of the Registry Program.

Discussion:

The Registry Program provides the department with a method of keeping track of the location of sensitive sites. The location of oil and gas leasing activities can often be adjusted if the area needing special care has been identified.

The alternatives of not using or requiring the use of the Registry Program could cause accidental losses of biologically significant sites.

CULTURAL RESOURCES

Cultural resources are archaeological or historical sites such as the Indian pits and cairns on department-managed land near Stevenson.

Proposed Action:

Administer the Oil and Gas Leasing Program in a manner that identifies and protects cultural resources.

Alternative:

Make no special effort to identify or protect cultural resources. (No Action)

Discussion:

The proposed action will supplement the capabilities of the Office of Archaeological and Historic Preservation (OAHP) which will reduce the risk of accidental damage or destruction of cultural resources. Methods to identify and protect them will be part of the oil and gas leasing process. Department managers, because of additional training and knowledge, will be able to adjust proposed activities, avoiding needless damage.

The alternative makes no special effort to identify or manage cultural resources. Instead, it relies entirely on OAHP for identification and management direction. Since OAHP is understaffed and underfunded, this would reduce the department's ability to protect cultural resources.

ROAD CONSTRUCTION

Proposed Action:

All roads constructed for conducting examinations, drilling, development and production activities on premises leased for oil and gas purposes shall ((~~comply with~~)) meet or exceed Road Construction and Maintenance Standards as specified by the Forest Practices Board (Chapter 222-24 WAC). [W1, W5]

Alternative:

All roads constructed for conducting examinations, drilling, development and production activities on premises leased for oil and gas purposes will conform to those standards approved and specified by the department. (WAC 332-12-460.) (No Action)

Discussion:

Nothing in the proposed policy denies the department the option of prohibiting road construction on certain sites. The proposed action provides a successful

method already in place to control environmental impacts of road construction. It assures unbiased assessment of operator performance. The preferred option also would provide access roads acceptable for other management purposes, possibly reducing future construction impacts and costs.

The alternative is silent about who establishes the standards and if they will be developed for the entire Oil and Gas Leasing Program or on a case-by-case basis. The criteria to be used to establish standards are not stated. Preventing environmental damage is not a clear mandate of this option. Further construction and improvements may be necessary to allow other uses of these roads.

PRELIMINARY INVESTIGATIONS

Proposed Action:

Preliminary investigations on department-managed lands will be allowed with a Right of Entry permit. Site-specific conditions may dictate certain restrictions.

Some preliminary investigations will be prohibited on water and wetland areas.

Alternative:

Preliminary investigations will be prohibited on all department-managed lands. (No Action)

Discussion:

The proposed action requires a Right of Entry permit which includes an environmental checklist and subsequent SEPA compliance. The permit and Plan of Operations will stipulate protective and mitigative measures as needed for site conditions.

The alternative could preclude certain investigative actions on sites where no environmental damage would occur, thus reducing the opportunities to discover potential commercial quantities of oil and gas. This would be inconsistent with the goal adopted by the Board of Natural Resources for the Forest Land Management Program to contribute to state energy production. It is also inconsistent with the proposed goal of the Aquatic Land Policy Plan to allow suitable state aquatic lands to be used for energy and mineral production.

SEISMIC EXPLORATION

Proposed Action:

Normally, all seismic exploration methods will be allowed on department-managed lands. However, site-specific conditions may preclude the use of certain methods entirely or limit or modify their use.

Alternative:

All seismic exploration methods will be prohibited. (No Action)

Discussion:

The proposed action is permissive only to the point that restrictions against seismic exploration will be made on a site-specific basis. A Right of Entry permit is required. A SEPA environmental checklist for explosive seismic exploration is requisite to the Right of Entry and subsequent SEPA compliance is required. The required Plan of Operations may propose mitigative combinations of seismic exploration methods.

Since some seismic methods would impact certain areas less than others, eliminating all seismic methods regardless of impact is too harsh.

It could also curtail or preclude an opportunity to discover oil and gas on department-managed lands. Therefore, the no-action alternative is considered inconsistent with the goals and policies of the department.

STRATIGRAPHIC AND EXPLORATORY DRILLING

Proposed Action:

Oil and gas stratigraphic and exploratory drilling will be allowed on department-managed lands under the following conditions:

- A valid lease is required and
- The lessee must submit a Plan of Operations for approval by the Oil and Gas Conservation Committee and the department prior to commencement of drilling and obtain a drilling permit. (WAC 332-12-360 and 344-12-050.) [W1]

Alternatives:

1. Prohibit oil and gas stratigraphic and exploratory drilling on department-managed lands (No Action).

2. Allow stratigraphic drilling but prohibit exploratory drilling on department-managed lands.

3. Restrict stratigraphic and exploratory drilling to certain geographic areas.

4. Restrict exploratory drilling to certain geographic areas.

Discussion:

Submission of an environmental checklist and a Plan of Operations for department approval prior to issuing a drilling permit will ensure that an environmental analysis of the site has been made.

Alternatives 1 and 2 are contrary to the department's proposed Oil and Gas Leasing Program goals and the trust mandate. Prohibiting drilling would also render meaningless oil and gas exploration techniques allowed up to the drilling phases. If exploratory drilling were prohibited, industry would have no incentive to conduct any other exploration, thus virtually eliminating future production of oil and gas in Washington.

The department could restrict either or both stratigraphic and exploratory drilling to certain geographical locations (Alternatives 3 and 4), such as southeastern Washington. ((~~These alternatives would call for making a judgment about the relative importance of environmental impacts.~~))

This action would remove areas of possible oil and gas potential from further testing and evaluation, and would be contrary to Oil and Gas Leasing Program goals and trust mandate. [WI8]

AFFECTED ENVIRONMENT,
SIGNIFICANT IMPACTS
AND
MITIGATION MEASURES

AFFECTED ENVIRONMENT

Three geologic factors are required for the accumulation of commercial quantities of petroleum and natural gas. They are:

- An adequate source of petroleum-generating material in the form of organic material, e.g., marine organisms or plant life;
- The presence of reservoir rocks in which important amounts of oil and gas can accumulate and from which they can be made to flow to wells for production at satisfactory rates; and
- Suitable structural or stratigraphic conditions that provide a means of localizing and entrapping the oil and gas in the reservoir rocks.

Six areas of the state are potential areas of interest for oil and gas exploration. They are: Willapa Hills, Puget Lowland, Whatcom County, Olympic Peninsula, Columbia Basin and certain aquatic lands. The designation of these areas as having oil and gas potential is based on current state-of-the-art technology. [W4]

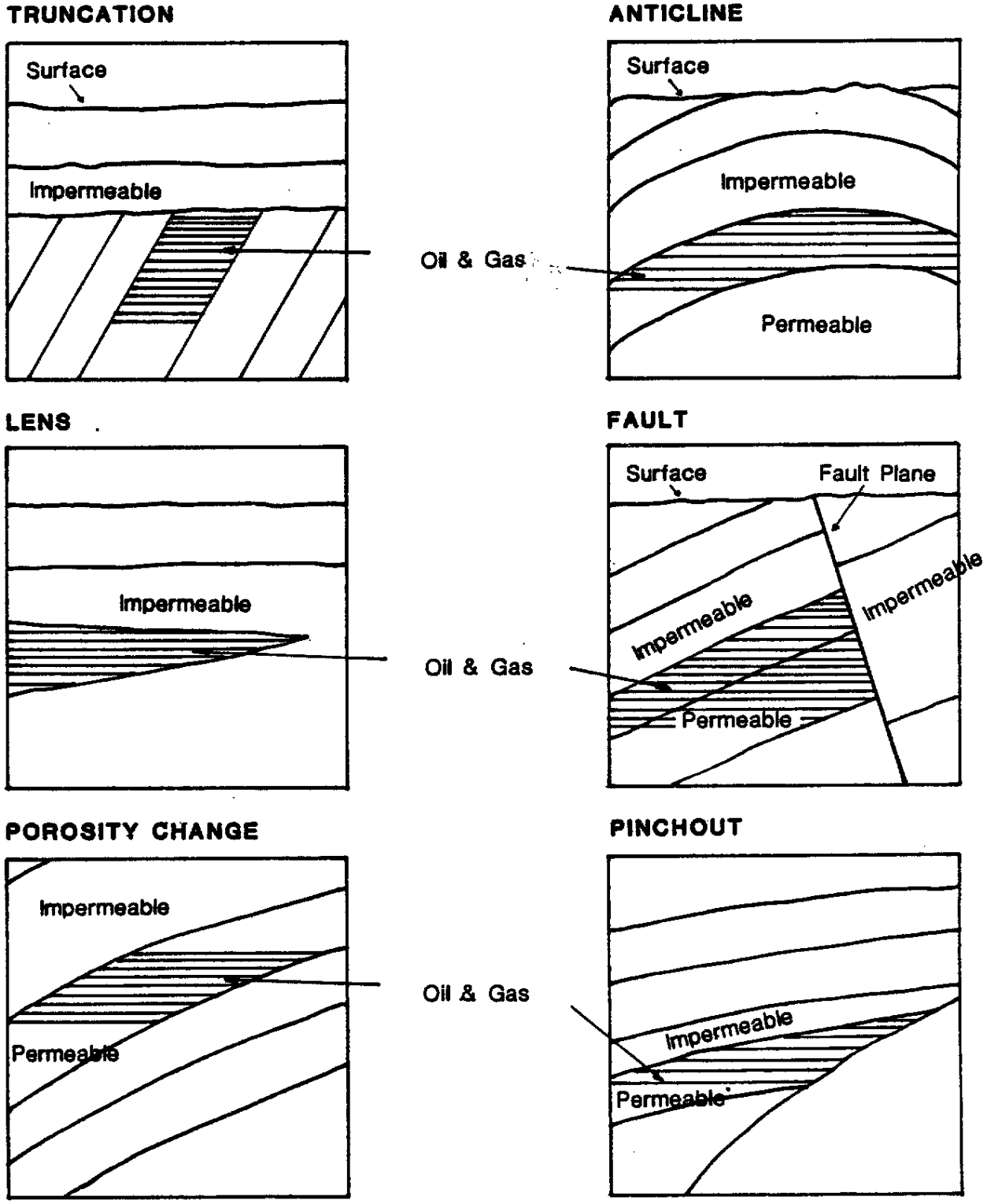
Until very recently oil and gas were thought to be produced from marine rocks. Recent research reveals the possibility of obtaining commercial production from nonmarine or continental rocks. In view of the changing theories of oil and gas generation, migration and accumulation, no area of the state can be ruled out as a potential area of exploration interest. However, the northeastern part of the state with extensive metamorphism (alteration of the original deposited rocks by heat and pressure), the Cascade Mountain area with extensive vulcanism and metamorphism and the metamorphic core of the Olympic Mountains appear to be unlikely sources of commercial quantities of oil or gas.

In the early days of exploration and development oil and gas were found in obvious geologic features such as anticlines. Anticlines are upward warpings or folds of the layers of rock like an arch which act as a structural trap (see Figure 1). Due to the presence of overlying rocks, the oil and gas migrates to the highest part of the fold where it is trapped by overlying impermeable rock layers. In the absence of such impermeable layers the oil and gas would migrate to the surface forming seeps and tar pits.

Early exploration was initially confined to areas where such anticlines could be readily mapped by geologists. With the drilling of more wells and the study of the results, the petroleum industry began to realize that other structural features such as faults could form a trap and stop the migration of oil and gas. A shift in the rock strata may place an impermeable rock layer across a permeable layer, forming a fault trap (see Figure 1).

Stratigraphic traps such as pinchouts, truncations, lenses and porosity changes were also observed (see Figure 1). In a pinchout the deposition process of a permeable rock layer such as sandstone may be interrupted and the deposition of an impermeable layer such as clay may take place. Any oil or gas migrating

Figure 1. Types of Oil and Gas Traps



through the sandstone could be trapped by the overlying clay or shale due to the pinchout of the sandstone. Folding and bending of the rock layers may be followed by erosion and truncation of some layers and subsequent deposition of other flat-lying layers. If an impermeable layer is deposited over the permeable layer, a trap may be formed. In the deposition of some layers, lenses of permeable rock may be deposited within more extensive impermeable material forming a trap. Finally, in the deposition of a rock layer a change may occur in the material being deposited. For example, sand may be deposited with fine-grained silt or clay in some areas. This fine-grained material may provide a permeability trap to the migration of oil or gas.

The department's Forest Land Management Program Environmental Impact Statement (FLMP EIS) (DNR, 1983a) extensively describes general state-wide environmental conditions by element of the environment. The FLMP EIS divides the state into seven physiographic provinces: the Olympic Peninsula, the Willapa Hills, the Glaciated Puget Sound Lowlands, the Cascade Mountain Range, the Okanogan Highlands, the Blue Mountains and the Columbia Basin (see Figure 2). Each province has its own unique combination of geological and other environmental characteristics. In many cases, boundaries between provinces are transitional, with a mix of certain features at the boundaries. (See Appendix C for a detailed description of the geology and soils found in these provinces.)

Aquatic lands owned by the state include 11 square miles of harbor area, 140 square miles of shorelands and 205 square miles of tidelands. (See Figure 3.) The state's ownership also includes the beds of all navigable waters within 3 miles of shore and all the bedlands of the Puget Sound. The department's draft Aquatic Land Policy Plan (DNR, 1984a) describes the basis for asserting ownership to these lands. Proposed oil and gas activities on, under or near waters of the state require completion of the SEPA process. Further discussion of affected aquatic lands will be part of that process.

Figure 2 Physiographic Provinces

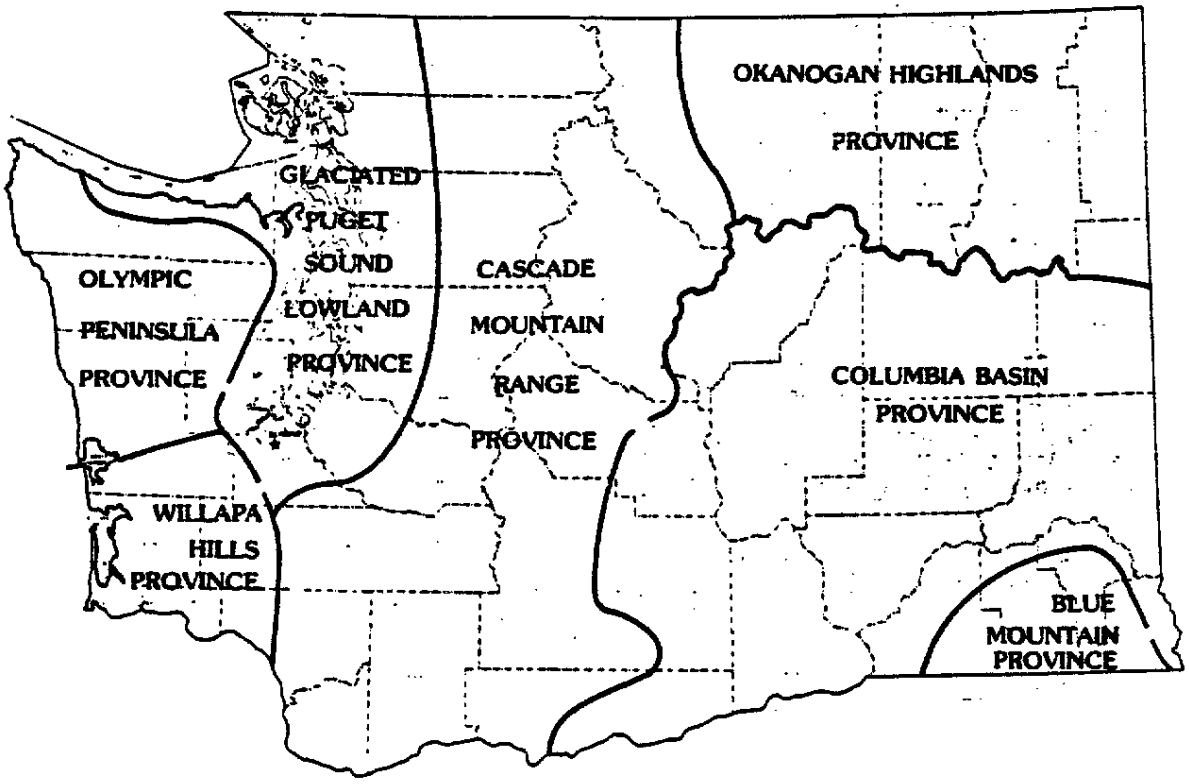
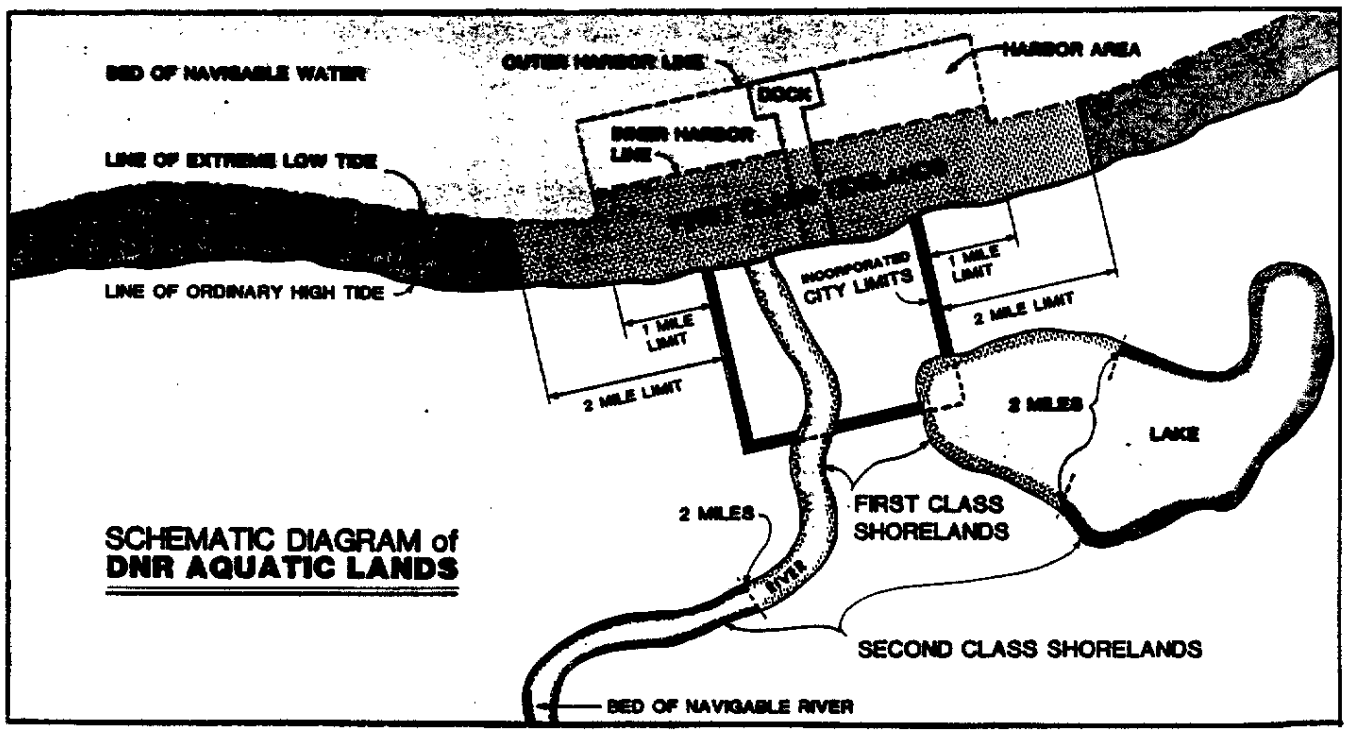


Figure 3 Department Aquatic Lands



OVERALL MANAGEMENT DIRECTION

The department believes that coordinated planning between management programs can provide income to the state and the trusts from a variety of activities, yet maintain a healthy natural environment for present and future generations.

((~~During the last year~~)) In 1984, the department adopted a management plan for department-managed forest lands and issued a proposed policy plan for aquatic lands. Since the Oil and Gas Leasing Program affects both forest and aquatic lands, the goals of their management plans are repeated here. The Oil and Gas Leasing Program goals further define forest and aquatic land management.

FOREST LAND MANAGEMENT GOALS

Conserve and enhance the natural resources of state forest land.

- Provide a sustained yield of timber through intensive forest management.
- Integrate the needs of nontimber resources into the management of the timber resource.
- Protect from major losses, such as those caused by fires, insects, animals and diseases.

Provide financial support that balances the level and flow of revenue to the trusts.

- Provide for both the short-term and long-term needs of the trusts.
- Diversify management practices to moderate economic risks.
- Anticipate and respond to market opportunities.

Provide social and economic benefits.

- Provide for multiple use on forest land.
- Contribute to the viability of the forest products industry.
- Contribute to state energy production.

AQUATIC LAND MANAGEMENT GOALS

Conserve and enhance aquatic lands and associated resources.

- Meet or exceed environmental quality standards.
- Maintain or improve the productivity and usefulness of aquatic lands.
- Provide high quality habitat for wildlife on state aquatic lands.

Provide social and economic benefits.

- Promote access to and recreational use of state aquatic lands.
- Encourage water dependent uses.
- Promote the production on a continuing basis of renewable resources.
- Allow suitable state aquatic lands to be used for energy and mineral production.
- Generate income from use of aquatic lands.

OIL AND GAS LEASING PROGRAM GOALS

Conserve and enhance the natural resources of state lands.

Integrate oil and gas resource management with the management of other state land resources.

Protect from and reduce or eliminate losses caused by erosion, pollution of ground and surface waters and disruption of wildlife habitats.

Provide financial support.

Provide a financial yield from oil and gas activities through lawful land management.

Provide for both the short-term and long-term needs of the trusts and the public.

Anticipate and respond to varying levels of oil and gas industry activities.

Integrate land uses to moderate economic risks.

Provide social and economic benefits.

Provide for multiple use on state lands.

Contribute to the potential of the oil and gas industry.

Contribute to state energy production potential.

DEPARTMENT LEASING POLICIES

Laws applicable to the Oil and Gas Leasing Program are too numerous to state as policy, but all procedures required to implement applicable law are adopted as departmental policy. Those policies proposed by the department which affect the administrative process of oil and gas leasing (excluding exploration or drilling) are briefly described below to give the reader a frame of reference for further discussion. Since leasing is strictly an administrative process in which no environmental impacts occur, no mitigative measures are discussed. Alternatives are discussed in the previous section.

The alternative to an oil and gas leasing program would be a no-lease policy. A no-lease policy on federal land grant trust lands managed by the department would be inconsistent with the Washington Constitution and Enabling Act mandate of generating income for trust beneficiaries.

LANDS AVAILABLE FOR LEASE

All department-managed lands are available for oil and gas leasing. However, some lands are unavailable because of existing laws, regulations or by order of the Commissioner of Public Lands. No applications will be accepted on such lands and the applicant will be informed of the determination early in the administrative process.

Some lands nominated by the applicant may already be in forest production or under surface lease for activities such as grazing, agriculture and residential use. Oil and gas activities could pose significant adverse environmental impacts to the surface lessee's operation. Lease applications will be accepted only for those tracts where it is determined that significant adverse impacts will not occur.

The SEPA process and the department's Sensitive Area Planning process may identify other lands that will be withheld from leasing. This decision will be based on site-specific conditions. **[W11]**

LANDS AVAILABLE FOR CONDITIONAL LEASE

There are two categories of state-owned lands which may be offered for oil and gas lease, but the lease document in both cases may be conditioned by various degrees of restriction or prohibition.

1. The state owns both surface and mineral rights, but the surface rights are leased for other activities such as parks, wildlife refuges, municipal watersheds, etc. Such lands may be offered for oil and gas leasing but entry and surface activity of any type may be prohibited. Use of this land for surface activity would be contingent upon completion of an

Environmental Checklist, further SEPA analysis and acceptable mitigation. Directional drilling beneath this category of property from adjoining lands would be permitted (Chapter 78.52 RCW and WAC 344-12-078).

2. The state owns the mineral rights but has relinquished the surface rights through administrative procedure. Mineral rights on these lands may be leased for oil and gas purposes but surface activity by a lessee would be prohibited unless the lessee 1) obtains a waiver of damages, 2) provides for full payment of damages, 3) provides surety to mitigate such damages or 4) institutes an action in Superior Court of the county in which the lands are located. Seismic exploration and drilling will be allowed contingent upon complying with SEPA (Chapter 197-11 WAC) and obtaining permits (Chapter 78.5((3))2 RCW and Chapter 344-12 WAC). Directional drilling beneath this category of property from adjoining lands would also be permitted (Chapter 78.52 RCW and ((4))WAC 344-12-078).

LANDS WITHHELD FROM LEASING

If deemed to be in the best interest of the state to do so, the Commissioner of Public Lands may withhold any tract of land from leasing for oil and gas purposes.

LEASING OF AQUATIC LANDS

The department is currently withholding department-managed marine and estuarine aquatic lands from lease. These include lands under the Pacific Ocean out to three miles, Puget Sound, the Strait of Juan de Fuca, the Strait of Georgia, Grays Harbor, Willapa Bay, and the Columbia River upstream to Puget Island. A future decision to allow leasing or exploratory drilling will be made only after completion of an Environmental Impact Statement and a determination by the Commissioner of Public Lands that the activity would be in the public interest. Surface drilling is prohibited by law in and within 1,000 feet of Puget Sound and the Strait of Juan de Fuca (RCW 90.58.160).

The department will permit oil and gas leasing of department-managed lands under fresh water. Surface drilling is prohibited on these lands. Directional drilling is permitted beyond 200 feet of the ordinary high water mark and as otherwise permitted by law.

WATER AND WETLAND AREAS

Oil and gas seismic surveys, drilling, development and production will be prohibited within 200 feet of any Type 1, 2, 3 or 4 waters and wetlands of the state as defined by WAC 222-16-020, -030 and WAC 344-12-040.

DEPARTMENT-INITIATED OIL AND GAS LEASE APPLICATIONS

Oil and gas lease applications on state-owned lands may be initiated by any person (WAC 332-12-240). In addition, the department may initiate oil and gas lease applications in the name of the state when it appears the state may benefit.

NOTIFICATION OF OIL AND GAS LEASING

Notification of impending oil and gas leasing will be provided by the department to surface owners of record upon acceptance of oil and gas lease applications in the following situations:

- Severed mineral rights (surface rights have been relinquished by the state)

  and

- Surface leased by other public agencies

PLAN OF OPERATIONS

A Plan of Operations describing intended exploration activities and measures to mitigate environmental impacts must be submitted to and approved by the department prior to entry and initiation of surface operations. The Plan of Operations must be approved before any permits will be issued. The operator must conduct exploration activities according to the Plan of Operations.

RIGHT OF ENTRY

An operator must obtain a Right of Entry permit from the appropriate department Area office to conduct surveys on department-managed lands. The operator must also contact the appropriate department Area office prior to entry upon the land.

A Right of Entry permit is not required to conduct surveys on department-managed land under an oil and gas lease provided the lessee of such land is contracting for or conducting the survey.

SEISMIC EXPLORATION PERMITS

Shot-hole seismic exploration requires a permit issued by the Oil and Gas Conservation Committee (WAC 344-12-050).

Selection of the proposed action for the following policies was guided by an environmental analysis.

RESOURCE PROTECTION

PLANTS AND ANIMALS

Proposed Action:

Avoid impacts on plant and animal species considered endangered in Washington. Within trust management obligations avoid impacts on species considered threatened, and consider avoiding or lessening impacts on species considered sensitive.

Alternatives:

1. Provide only the protection for endangered, threatened and sensitive species that federal law requires.

2. Avoid impacts to all endangered, threatened and sensitive species.

ENVIRONMENTAL PROTECTION AND MITIGATION MEASURES

The impacts of the proposed policy and its alternatives are discussed in detail in the FLMP EIS (DNR, 1983b). Species are listed in the Department of Game Policy Manual (WFL-pol-.602) and the Natural Heritage Program publication Endangered, Threatened and Sensitive Plants of Washington (DNR, 1984b).

Natural Environment

Earth, Air, Water:

No significant impacts are anticipated.

Plants and Animals:

The proposed protection will help prevent extinction or extirpation of endangered species. Considering sensitive species during the oil and gas leasing process protects many habitats or populations that might otherwise be lost because of the operator's or lessee's lack of information.

The alternatives could cause accidental loss of irreplaceable plant and animal species.

Energy and Natural Resources:

No significant impacts are anticipated.

Built Environment

No significant impacts are anticipated.

NATURAL AREA PRESERVES AND THE REGISTRY PROGRAM

Proposed Action:

Preserve plant and animal diversity by designating certain parcels of state land under the Registry Program and in Natural Area Preserves.

Alternatives:

1. Do not use the Registry Program (No Action)

2. Encourage but do not require use of the Registry Program.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The impacts of the proposed policy and its alternatives are discussed in the FLMP EIS (DNR, 1983b). Sites are selected for the Natural Area Preserve System based on element priorities and an analysis of element occurrences and site characteristics. The Natural Heritage Plan (DNR, 1983c) describes the elements and provides guidelines for their protection.

Natural Environment

Earth, Air, Water:

No significant impacts are anticipated.

Plants and Animals:

The Registry Program provides the department with a method of keeping track of the location of sensitive sites. The location of oil and gas leasing activities can often be adjusted if the area needing special care has been identified.

The alternatives, by not using or requiring the use of the Registry Program, could cause accidental losses of biologically significant sites.

Energy and Natural Resources:

No significant impacts are anticipated.

Built Environment

Environmental Health:

No significant impacts are anticipated.

Land and Shoreline Use:

Designating certain parcels of land as Natural Area Preserves will remove them from other present or potential uses.

Transportation, Public Services and Utilities:

No significant impacts are anticipated.

CULTURAL RESOURCES

Cultural resources are archaeological, ((or)) historical or religious sites such as the ((~~Indian~~)) Native American pits and cairns on department-managed land near Stevenson.

Proposed Action:

Administer oil and gas leasing in a manner that identifies and protects cultural resources.

Alternative:

Make no special effort to identify or protect cultural resources. (No Action)

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The impacts of the proposed policy and its alternative are discussed in the FLMP EIS (DNR, 1983b).

Natural Environment

No significant impacts are anticipated.

Built Environment

Environmental Health:

No significant impacts are anticipated.

Land and Shoreline Use:

The preferred option will supplement the capabilities of the Office of Archaeological and Historic Preservation (OAHP) which will reduce the risk of accidental damage or destruction of cultural resources. Methods to identify and protect them will be part of the oil and gas leasing process. Department managers, because of training and knowledge, will be able to adjust proposed activities, avoiding needless damage.

The alternative could cause destruction of cultural resources because of a lack of sufficient information.

Transportation, Public Services and Utilities:

No significant impacts are anticipated.

ROAD CONSTRUCTION

Proposed Action:

All roads constructed for conducting examinations, drilling, development and production activities on premises leased for oil and gas purposes shall comply with Road Construction and Maintenance Standards as specified by the Forest Practices Board (Chapter 222-24 WAC).

Alternative:

All roads constructed for conducting examinations, drilling, development and production activities on premises leased for oil and gas purposes will conform to those standards approved and specified by the department. (WAC 332-12-460.) (No Action)

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Road construction impacts are described in detail in the department's FLMP EIS (DNR, 1983b). The following is a brief description of specific oil and gas

leasing process-related impacts. Applicable standards described in the Washington Forest Practices Rules and Regulations (Washington State Forest Practices Board, 1982) will be made a part of the operator's Plan of Operations.

Since the department administers the Forest Practices Act (FPA) it could be argued that there is no difference between alternatives. However, the FPA does not apply to nonforested areas. The no-action alternative could decrease protection to soils and water if standards were developed that provided less protection than the FPA.

Natural Environment

Earth:

Access road building ((may)) will result in compaction and removal of topsoils. Cut and fill procedures used in road construction may result in changes in topography. [W18]

Mitigation: Topsoil removed during road construction will be stockpiled and used for reclamation of the road. Compaction of soils could be remedied by scarification after the need for the road is gone. Overall impacts to topography associated with road building would be minor and insignificant. Access roads will take advantage of ((~~pre-existing-natural~~)) topography whenever possible. [W18]

Air:

Dust from road building may increase particulate matter concentration in the air.

Mitigation: Use of dust-abatement procedures would reduce particulate concentrations.

Water:

Surface water (streams or rivers) movement and quality may be impacted by sedimentation due to bridge construction or culvert installation.

Road construction activities may decrease absorption areas and increase surface runoff.

Mitigation: Site-specific impacts to surface water quality and movement by above activities will be identified and mitigation measures will be described in the Plan of Operations. Such road construction practices will be guided by ((WAG)) Chapter 222-24 WAC, Forest Practices Standards for Road Construction.

Catchment and sedimentation basins may be required to regulate increased runoff of rainwater. Disturbed areas will be held to the minimum required to reduce runoff.

Plants and Animals:

Wildlife habitat and unique species of animals or plants may be disrupted by road building activities. Small mammal habitat will be destroyed or displaced to other areas. Roads may act as barriers to or corridors for movements, depending on species and time of year.

Vegetation would be destroyed by road construction activities.

Mitigation: Site-specific review of areas to be disturbed by road building activities will be made using the Natural Heritage data system to identify sensitive species. The appropriate Department of Game regional biologist may be consulted to identify areas of nesting, calving or breeding. All findings and recommendations will be considered for inclusion in the Plan of Operations. Use of pre-existing roads will be required wherever possible. Some destruction of vegetation is unavoidable. Public pressure on sensitive areas will increase through easier access. If necessary, contractors may be required to install gates with locks. [W1, W16]

Energy and Natural Resources:

No significant impacts to these elements are expected.

Built Environment

Environmental Health:

Noise:

Noise from road building, blasting and earth moving activities and related support vehicles may pose a nuisance to populated areas.

Mitigation: Noise reduction measures will include proper muffling of equipment. Construction activities in or near populated areas could be restricted to daylight hours. Use of topographic or vegetative barriers wherever possible would reduce noise levels. Measures to control noise impacts will be made a part of the site-specific Plan of Operations.

Land and Shoreline Use:

Existing Land Use:

Road construction activities may temporarily impose a different land use on areas already used for other activities, e.g., forest production, grazing, surface mining, etc.

Mitigation: Road construction will be coordinated with surface users. Proof of agreement must be furnished before the Plan of Operations is approved.

Aesthetics:

Road building activities and presence of heavy machinery may be offensive to some and may impair vistas.

Mitigation: Placing access routes behind vegetative and topographic barriers wherever possible would reduce impacts to vistas.

Agricultural Crops:

Lands under cultivation may be impacted temporarily by road construction.

Mitigation: An agreement between the surface lessee and the oil and gas lessee regarding damages to cultivated lands will be made prior to approval of the the Plan of Operations by the department.

Transportation:

Transportation Systems:

Increased heavy vehicle use (e.g., gravel trucks or fuel trucks) on marginal secondary roads during poor weather could cause damage to pavement or roadbed.

Mitigation: Local seasonal load restrictions on both arterial and secondary roads will be observed by contractors.

Vehicular Traffic:

Depending upon the location, increased vehicular movement associated with road construction may impede traffic or constitute a traffic hazard. Use of access roads by unauthorized vehicles may inconvenience passage of construction equipment and supply vehicles. Improvement of access roads for drilling traffic may in turn encourage greater use by recreational vehicles.

Mitigation: Time limitations may be required if passage and movement of construction equipment and vehicles cause impediments or constitute a traffic hazard. Locked gates and/or guards may be required to regulate or prohibit operation of unauthorized vehicles on access roads. Roads may be barricaded and abandoned at the close of operations.

Public Services/Utilities:

Solid Wastes:

Accumulation of solid wastes and trash related to road building could be both unsightly and a health hazard.

Mitigation: Solid wastes related to road building activities would be disposed of at approved dumping spots.

PLANS AND PERMITS REQUIRED FOR OIL AND GAS EXPLORATORY ACTIVITIES

Aerial Photography and photogeologic interpretation may be used to examine geologic, topographic and vegetative patterns that could indicate oil and gas producing formations. This activity occurs early in the investigation process, before the department becomes involved. No permits are required.

Geologic Mapping is normally conducted on foot from existing trails and roads. In remote areas the operation may be supported by pack animal, helicopter or boat. Maps are drawn of geologic features from on-the-ground observations. Areas to be mapped, transportation methods and timing must be described in the Plan of Operations. A Right of Entry permit is required.

Magnetic Surveys are normally conducted from the air. Since no on-the-ground activity occurs, the department imposes no regulations or restrictions.

Gravity Surveys are conducted from aircraft and ground vehicles using existing roads and trails. Surveys done from aircraft are supported by measurements on the ground. Areas to be surveyed, methods, survey stations and timing are described in the Plan of Operations. A Right of Entry permit is required.

Magnetotelluric Exploration and Time-Domain Electromagnetic Soundings normally use existing roads and trails. These surveys cause slight surface disturbances. Location of survey sites, methods and timing of surveys are described in the Plan of Operations. A Right of Entry permit is required.

Geochemical Sampling requires collection of small samples of soil, rock or water using small scoops or soil augers. This may be done along existing roads and trails or on foot. Areas to be surveyed and timing of surveys are described in the Plan of Operations. A Right of Entry permit is required.

Vibratory (or Thumper) Seismic Surveys normally use existing roads and trails. Area, method and timing of surveys must be described in the Plan of Operations. Vibratory surveys are prohibited within 200 feet of Type 1, 2, 3 or 4 waters and wetlands. A Right of Entry permit is required.

Air Shot Surveys (Poulter method) normally use existing trails and roads. In remote areas new trail or road construction may be required. Location, methods and timing of surveys must be described in the Plan of Operations. These surveys are prohibited within a minimum of 200 feet of Type 1, 2, 3 or 4 waters and wetlands. A Right of Entry permit and an environmental checklist is required.

Explosive Seismic Surveys normally use existing trails and roads. In remote areas new trail or road construction may be required. Location, methods and timing of surveys must be described in the Plan of Operations. These surveys are prohibited within a minimum of 200 feet of Type 1, 2, 3 or 4 waters and wetlands. The drilling of the shot-hole (normally less than 200 feet deep) requires a permit from the Oil and Gas Conservation Committee (RCW 78.52.120 and WAC 344-12-050). An environmental checklist is part of the permit application. A Right of Entry permit is required.

Stratigraphic Test Drilling normally uses small (less than one acre) drill pads and existing trails and roads. The drillsite is frequently located along an existing trail or road. Holes are drilled less than 2,000 feet in depth to obtain geologic information on the different strata penetrated. ((A Plan of Operations describing location, method, equipment and timing of the activity are required.)) A Plan of Operation which includes location, method, equipment, timing and Department of Ecology-approved plans for disposal of drilling fluids and solid wastes, etc., is required. A permit from the Oil and Gas Conservation Committee is required (RCW 78.150.120 and ((Ch.)) WAC 344-12-050 ((WAG))). A supplemental environmental checklist is part of the permit application. A lease is required prior to beginning stratigraphic test drilling. [W11]

Exploratory Drilling requires access road, drill pad construction and disposal of drilling fluid and solid waste. A permit, fees and environmental checklist are requirements of the Oil and Gas Conservation Act (RCW 78.52.120 and WAC 344-12-050). ((Exploratory drilling requires an approved Plan of Operations describing location, method, Department of Ecology approved plans for disposal of drilling fluid, etc.)) A Plan of Operation which includes location, method, equipment, timing and Department of Ecology-approved plans for disposal of drilling fluids and solid wastes, etc., is required. A lease is required prior to beginning exploratory drilling. [W11]

PRELIMINARY INVESTIGATIONS

Proposed Action:

Preliminary investigations on department-managed lands will be allowed with a Right of Entry permit. Site-specific conditions may dictate certain restrictions, such as season of operation.

Some preliminary investigations will be prohibited on water and wetland areas.

Alternative:

Preliminary investigations will be prohibited on all department-managed lands. (No Action)

AERIAL PHOTOGRAPHY

Most oil or gas exploration projects start with a survey of the latest aerial photography available for the area chosen. Besides serving as a base for plotting geologic features, aerial photographs can also be used to pinpoint areas of concern such as game management areas, slide areas, unstable soils, springs or water supplies and depending upon photograph scale, areas of threatened or endangered plants and animals.

Aerial photographs are quite similar to planimetric maps. Their great value lies in portraying a definite and detailed picture of the earth's surface. A good aerial photograph of an area often serves as the basis for a detailed geologic mapping project since even the most detailed maps do not portray exact renderings of access roads, clearings, streams or topographic features that can be used to locate geologic features in the field. (Compton, 1962.) In some areas, aerial photographs portray rock units, outcrops and geologic structure so clearly that features can be drawn on the photographs after very little field work by the geologist.

GEOLOGIC MAPPING

Many geologists consider field studies to be the most basic and primary method of generating geologic data. Some studies may be as simple as visiting a single roadcut or quarry, noting and interpreting the geologic features observed and collecting rock samples. On the other end of the spectrum, some detailed projects require months of geologic mapping, careful and systematic sampling, and thorough integration of field and laboratory measurements.

Geologic mapping is so essential to field studies the two terms are often used interchangeably. The mapping function is used to relate data observed at separate outcrops, plot measurements and details of possible oil and gas bearing structures and to permit interpretations of features too large to be studied in

a single rock outcrop. Many oil and gas bearing structures, for example, have been discovered only after integrating sample observations made over an area of tens of square miles. When properly interpreted and presented, geologic maps and supporting data are an excellent means of converting information.

The complement of equipment carried by most field geologists is modest; the basic requirements are usually limited to what can can be attached to the belt or carried in a knapsack. Transportation through field areas can be by different modes. For example, many open areas of Eastern Washington can be traversed most efficiently by using pack animal or helicopter for support, while geologic observations in Western Washington's brushy lowlands may require traveling by truck, motorcycle, foot or boat.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The use of aerial photography cannot be denied; thus, the no-action alternative is not applicable.

Environmental impacts attributable to geologic mapping and related field work and observations are considered to be nonsignificant. Prohibiting entry for geologic mapping would afford no further environmental protection.

The department requires approval of a Plan of Operations and a Right of Entry permit before geologic mapping can be done. Before the Right of Entry permit is issued, department staff review the current data file to ensure the activities will not disturb areas containing sensitive plants, wildlife or archaeological features. Appropriate protective measures are determined through consultation with the Natural Heritage Program (DNR), the Nongame Program (WDG) and the Office of Archaeology and Historic Preservation (OAHP).

MAGNETIC SURVEYS

Sedimentary rocks favorable to oil and gas formation are practically nonmagnetic as compared to the deeper "basement" rocks. Magnetic measurements provide patterns of magnetic anomalies from which the spatial extent and thickness of sedimentary deposits can be inferred. A magnetic survey is conducted by aircraft using airborne magnetometers. Such a survey would likely be accomplished by flights at about 1,500 feet in a grid pattern of approximately 3-mile spacing. A survey yielding approximately 2,000 linear miles of magnetic profiles would require about 7 days' flying time if there were no weather delays.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental impacts from airborne magnetic surveys would be limited to the effect of aircraft noise on wildlife and local residents. Airborne magnetic surveys are made over wide areas, irrespective of ownership boundaries.

Mitigation: The only mitigation would be to restrict flights to certain areas. Restricted airspaces are so designated and controlled by the Federal

Aviation Administration (FAA). The Department of Natural Resources may not restrict entry into or through air space above its lands unless it is coincidental with FAA restricted air space. With this exception, there are no mitigative measures for the impacts identified with airborne magnetic surveys.

GRAVITY SURVEYS

Gravity surveys use both ground and airborne equipment, but most airborne surveys also require that supplementary gravity meter readings be taken on the ground. Measurement stations are usually laid out in a grid with spacing from ½ to 3-mile intervals. Gravity-meter readings are taken on the ground by either vehicle- or helicopter-transported crews.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Natural Environment

Earth, Air, Water:

No significant impacts are anticipated.

Plants and Animals:

Environmental impact is limited to the sound and disturbance of gravity crews, survey crews and if used, the helicopter. Helicopter support requires landings at frequent intervals which may crush vegetation and temporarily disturb nearby wildlife.

Mitigation: The technology has recently been developed to conduct gravity surveys entirely from the air. Helicopter-transported gravity surveys may be made using an inertial guidance system, making ground surveying unnecessary. Use of this technique would eliminate the damage to plants and reduce the disturbance to wildlife. The Plan of Operations and Right of Entry permit procedure would condition gravity survey landings.

The alternative that would prohibit gravity surveys would have no impact. However, the impacts of the proposed action are so minimal that such prohibition is unreasonable.

Built Environment

No significant impacts are anticipated.

MAGNETOTELLURIC EXPLORATION

Magnetotelluric (M/T) exploration involves measurement and interpretation of the electrical resistivity of the earth's crust and resistivity changes with depth in a region containing tens of square miles. The resistivity and its changes are

geologically interpreted in terms of rock types and their crustal distribution. The technique and its variations have proven useful in the Columbia Plateau of Eastern Washington where sequences of lava thousands of feet thick make determination of the character of the underlying formations impossible by more conventional geophysical methods. Such an M/T study consists of a series of widely spaced sites which usually fall into a line. Although the theory behind M/T is complex, the exploration method is simple, straight forward and produces minimal impact to the environment.

A typical M/T site is on level ground in loose soil with little or no vegetation for 1,000 feet on each side. Positions for four lead-alloy electrodes are surveyed and staked 90 degrees apart (Figure 4) at each location. A hole 2 feet wide and 2 feet deep is dug at each location. The electrodes are placed in the hole and partially buried. At a separate location, one vertical and two horizontal induction coils are placed in the ground. The vertical coil is placed in the bottom of a 5-inch hand-augered hole 6 feet deep. The horizontal coils are placed in trenches 7 feet long, 6 inches deep and 6 inches wide and separated from each other by at least 6 feet. The coils and electrodes are all connected by surface conductors to a service truck with recording and interpretive capabilities. Recordings are made for 8 to 10 hours at each site. The equipment is then removed, holes are filled and the site returned to original condition.

The M/T method is employed only in remote areas; power lines, telephone lines, electric fences, railroads, freeways and wind blowing through trees are all sources of interference to the very low frequencies being examined.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Natural Environment

Earth:

Only minor disruption of the surface occurs in connection with this technique.

Mitigation: Simple excavation, backfilling and reseeding by the contractor would mitigate any impacts incurred.

The alternative to deny these surveys is unreasonable, since impacts of the proposed action are minimal.

Air, Water:

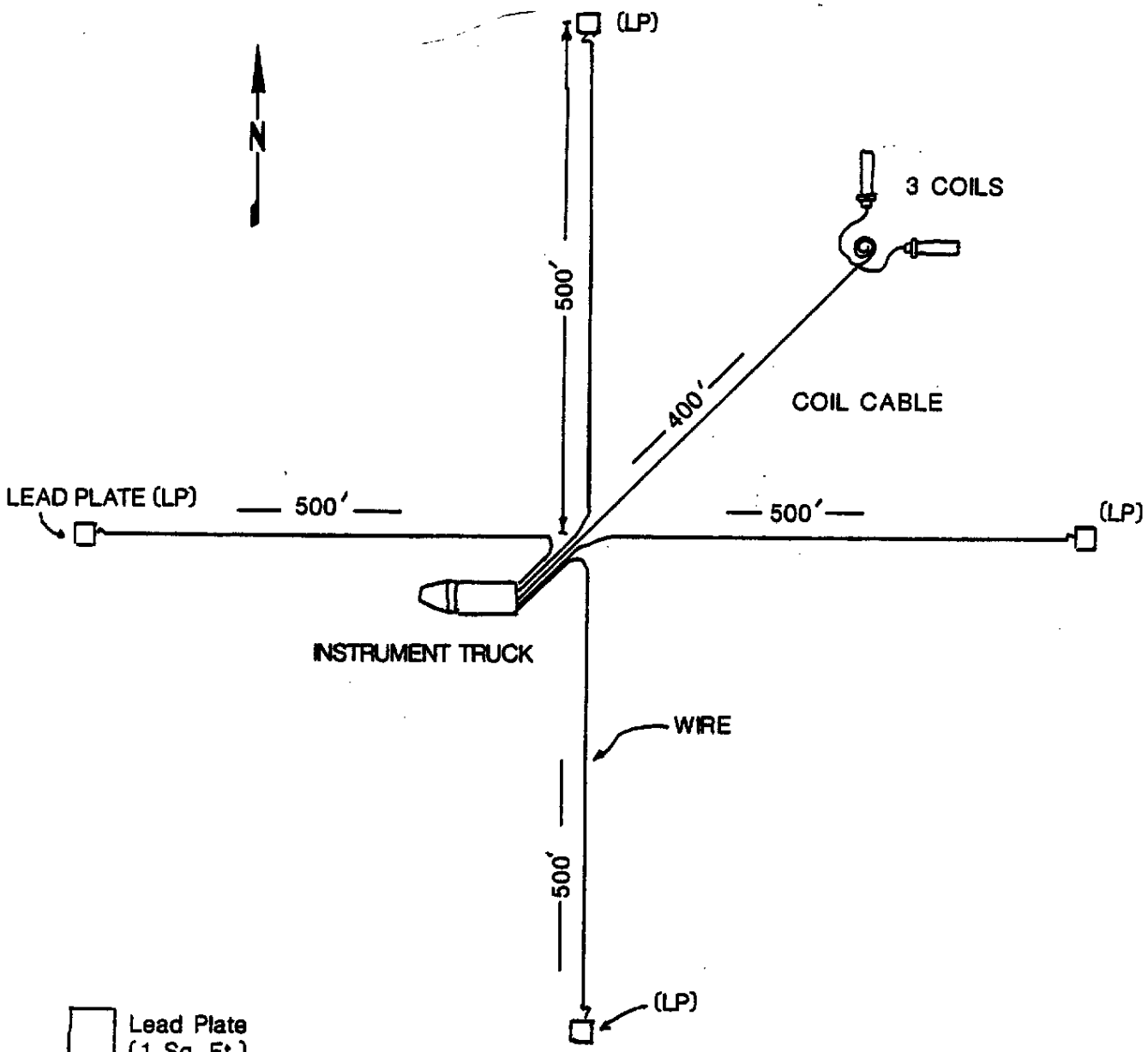
No significant impacts are anticipated.

Plants and Animals:

Some vegetation would be removed and animals disturbed by the presence of the survey team.

Mitigation: Impacts to wildlife would be minimized by coordinating exploration activities so they would not coincide with breeding, nesting or calving

Figure 4. Standard Magnetotelluric Site Layout



NOTE:
Lead Plates and Coils are Buried.
Wires and Cables are Laid on Top of the Ground.

Source: C.W. Ruth, 1973.

activities, or wintering areas. The Plan of Operations and Right of Entry permit would stipulate time or area restrictions.

Built Environment

No significant impacts are anticipated.

The alternative would provide no further protection than the mitigated proposed action.

TIME-DOMAIN ELECTROMAGNETIC SOUNDINGS

Time Domain Electromagnetic (TDEM) soundings is not a new geophysical technique. The Russians have been using it for over twenty years, but it hasn't gained popularity in the U.S. yet. TDEM is easier and quicker to record than Magnetotellurics, does less environmental damage, is cheaper per site, and usually produces superior results. The Colorado School of Mines is the only group we know of using the technique presently. The source point is a large, about three miles long, loop of wire which conducts an electrical current produced by a generator. It gives off a magnetic current which is conducted throughout the area tested and read and recorded at many locations. The sounding recording is processed by a complex computer program that models the geologic structure anticipated beneath the test site and compares the model with the actual reading, adjusting the model to both the actual recording and the other recordings taken in the area of interest. After processing, the results are interpreted to provide a 'picture' of the geologic structures, its depth, and its size. (Written communication, David Foley, W. B. Mays and Associates, Ellensburg, WA to Walter Peck, Department of Game, June 22, 1983.)

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Both M/T and TDEM geophysical survey techniques were used on Department of Game lands in Eastern Washington within the last two years. Neither technique was considered by Washington Department of Game personnel to have lasting and significant environmental consequences if simple mitigative measures were employed. Such measures would include reclaiming shallow electrode trenches, keeping vehicles on established roads, policing survey-related trash and avoiding habitat areas in times of breeding or calving. (Walter Peck, Washington Department of Game, personal communication.)

The no-action alternative would eliminate impacts; however, since impacts are minimal, prohibition would be unreasonable.

GEOCHEMICAL SAMPLING

Geochemical sampling, as it applies to petroleum exploration, is a technique whereby soil or rock samples are collected and tested for trace quantities of

oil and gas. Samples may show a higher concentration of these residual fractures than those generally present in the soil, rock vegetation or sediments.

The technique used for soil sampling is uncomplicated and normally requires only simple hand tools. Samples are collected from certain soil horizons using hand-augers or small shovels. Soil sampling programs are usually accomplished on foot using existing trails. The spacing of sample sites will vary, depending upon the intensity of the sampling program. A more ambitious sampling program will operate out of a truck and will be conducted along existing roads.

A project undertaken in northern Yakima county by a major oil company in mid-1984 covered approximately 42,000 acres. One hundred fifty sampling stations were located and sample apparatus placed at each station. Four to five days were required to complete the study. A small hydrocarbon collector the size of a soft-drink can is used at each station; the detection technique is a modern variation of that used in the 1930s and 1940s. (David Foley, W.B. Mays and Associates, personal communication.)

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Natural Environment

Earth, Air, Water:

No significant impacts are anticipated.

Plants and Animals:

Personnel conducting a geochemical sampling program in an area of sensitive plants or critical game habitat could unknowingly destroy or disturb these areas.

> Mitigation: Entry to sensitive areas ((would)) will be denied or restricted as conditions of the Plan of Operations and Right of Entry permit. Impacts to wildlife would be minimized by coordinating exploration activities so they would not coincide with breeding, nesting or calving activities or nesting areas. [W18]

Built Environment

No significant impacts are anticipated.

The no-action alternative would have no impacts on the natural or built environment. However, prohibiting surveys would preclude any commercial production of oil and gas in Washington. This would be inconsistent with the goal adopted by the Board of Natural Resources for the Forest Land Management Program to contribute to state energy production. It is also inconsistent with the ((proposed)) goal of the Draft Aquatic Policy Plan to allow suitable state freshwater aquatic lands to be used for energy and mineral production.

SEISMIC EXPLORATION

The principle of seismic exploration is derived from seismology, the geophysical science dealing with earthquakes and related phenomena. Through controlled generation of accoustical energy pulses near the surface of the earth's crust, geophysicists are able to locate geological structures which could contain oil and gas. When these pulses or vibrations strike a layer of rock or other dense material, they divide into three parts: one part returns to the surface as reflected energy; another travels longitudinally along this layer at a greatly increased speed and a portion of it also returns to the surface as refracted energy. The remaining part passes downward and divides repeatedly as it hits new dense layers. Accoustical energy, returning to the earth's surface, is transformed by a series of microphones (geophones) into electrical energy, which in turn is recorded by a seismograph. Recordings yield a seismic section which is translated into an accurate picture of rock layers beneath the surface.

The two methods are illustrated in Figure 5. The refraction method uses the principle that the speed of the shock wave varies according to the elasticity and specific gravity of the rock. Wave speed indicates the depth and type of rock. In the reflection method shock waves are reflected like an echo when they strike a surface boundary between layers of different elasticity and specific gravity. The depth of the reflecting layer can be determined by measuring the time taken for the waves to travel to and from the reflecting layer. The energy source is small and relatively closer to the recording instruments for reflection shooting, while it is larger and farther away for refraction shooting.

A typical operation follows a survey line which transects the area being studied. This survey line would be part of a grid consisting of parallel lines, generally spaced at intervals of 2 to 10 miles, which would intersect and be roughly perpendicular to a second series of lines spaced at similar intervals. Energy would be induced into the earth along these lines at intervals (or multiples) of 220 feet. The reflected energy would be recorded by groups of geophones placed in an array about the energy source. Input from the geophones is collected and recorded. The data are translated and presented graphically. From the graphic information geologic structures are interpreted and decisions are made regarding advisability of stratigraphic or exploratory drilling.

The three most commonly used seismic survey techniques are vibratory (Vibroseis®), conventional (or shot-hole) and air-shot (Poulter).

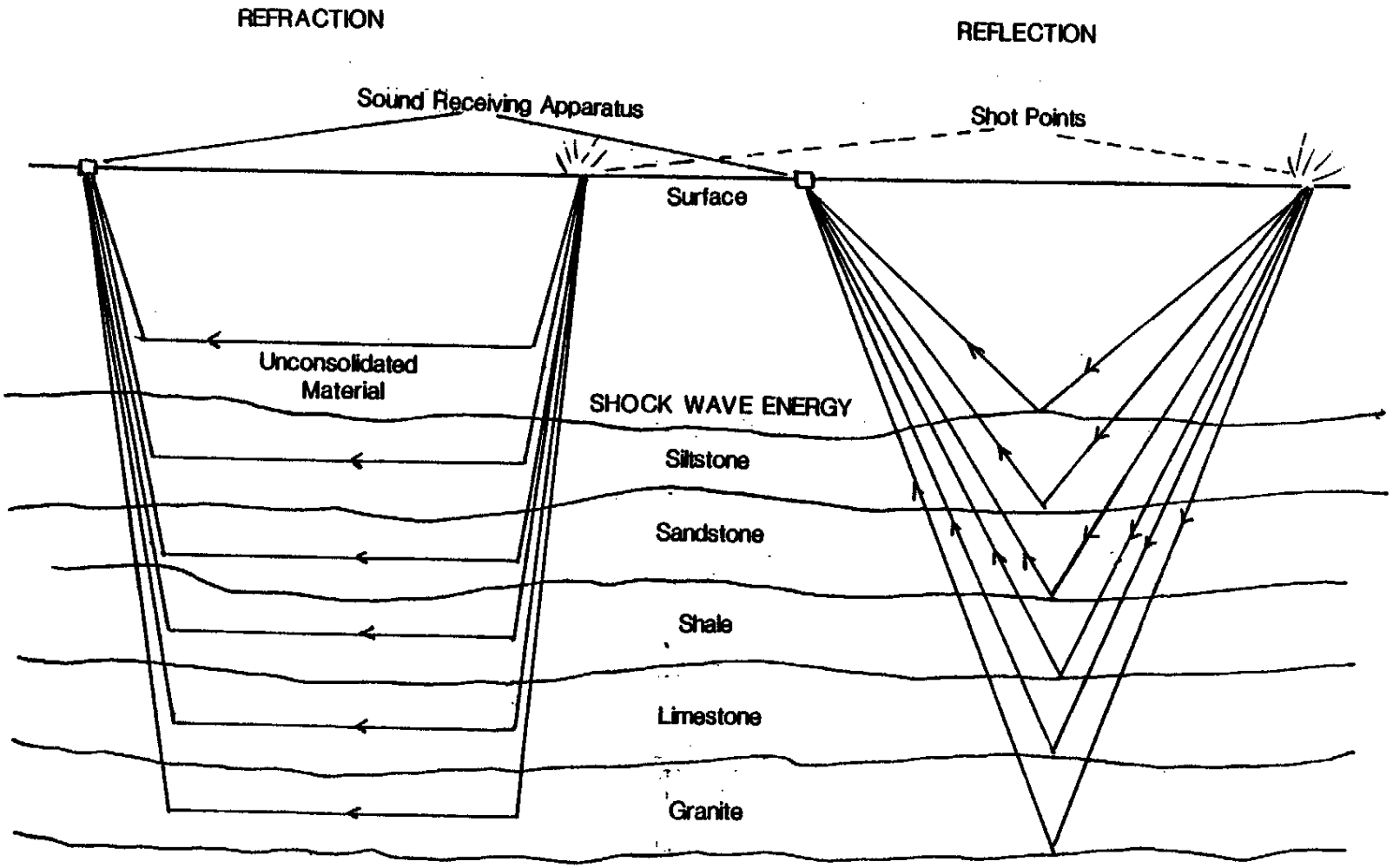
Proposed Action:

Normally, all seismic exploration methods will be allowed on department-managed lands. However, site-specific conditions may preclude the use of certain methods entirely or limit or modify their use.

Alternative:

All seismic exploration methods will be prohibited. (No Action)

Figure 5. Comparison of Refraction and Reflection Shooting



- VIBRATORY SURVEYS

Vibratory surveys (commonly called Vibroseis® - a trademark of Continental Oil Company) have been a frequently used seismic exploration technique in recent years. They are conducted entirely on the surface of the land. Energy is generated into the subsurface by vibrating the surface over a range of frequencies and durations, depending on prevailing noise conditions and energy requirements. The mechanical system is unique in that it is the only system that can control the pulse frequency (vibration) and duration, making it possible to match energy transmission characteristics for best signal returns.

A typical mechanical operation uses the following specialized equipment:

Four wheel-mounted vibrator units, gross weight 45,000 lb., 35,000 pounds on the pad.

One recorder vehicle, gross weight 45,000 lb.

One vibrator tender of similar size and weight to vibrator, gross weight 45,000 lb.

One gravity survey vehicle for data collection and recording.

The number of vehicles used depends on data collection requirements. A typical operation is: The vehicles are arranged in tandem 4 to 5 feet apart at a "source point". The vibrators are lowered to the ground by hydraulic jacks and the weight of each vehicle is applied to the vibrator pad. The vibrators are activated in unison from the recording truck for 20 seconds or less. The trucks are then moved forward for 18 to 24 feet and activated again. The process is repeated 6 to 24 times at each source point. A mechanical survey operation averages 3 to 4 miles daily. The seismic impulses at each source point are recorded via an array of geophones "spread" on the ground and connected to recording instruments in the gravity survey vehicle. The geophone spread runs in a single line 2 to 5 miles long, parallel to the route taken by the survey vehicles.

Because of the bulk and weight of the vehicles, the system is adaptable only to heavy-duty land vehicles and cannot be used in steep or mountainous terrain. The equipment must be used on roads or soils capable of supporting the vehicle weight. [W18]

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Natural Environment

Earth:

Soil compaction at "source points" could result from vibratory operations. In some areas the soil profile may contain large amounts of clay. Under certain conditions, ((~~some clays~~)) these soils exhibit a phenomenon known as liquification when subjected to vibration or shaking. Vibratory operations conducted at the top of steep slopes could cause partial failure, resulting in damage to property or people at the bottom of the slope. [W18]

Mitigation: Remedial measures such as soil scarification and, if necessary, filling cavities and tire marks to original contours will be required in the Plan of Operations.

If vibratory operations are contemplated in areas where unstable clays or soils may be present, the lessee or representative will consult with local ((~~planning authorities~~)) agencies or authorities with expertise to develop an acceptable Plan of Operations which will bypass areas of unstable soils. [W18]

The alternative (no action) would have no impacts.

Air:

No significant impacts to air quality or climate are anticipated by the proposed action or the alternative.

Water:

No significant impacts to water quality, movement or supply are anticipated for either the preferred action or the alternative. (See Appendix A for further discussion of vibratory survey impacts.)

Plants and Animals:

The significance of impacts to plants and animals will vary with the type and amount of vegetation and species present on a particular area.

Compaction of vegetation could occur. Surveying and support operations could affect vegetation on either side of the seismic line.

Disturbance to animal life could be caused by noise, human and vehicular activity and the use of vibratory equipment. Small mammal habitat in source point areas could be disturbed.

Due to the prohibition of vibratory surveys within 200 feet of Type 1, 2, 3, and 4 waters and wetlands, no significant impact to anadromous fish embryos are anticipated.

Mitigation: In areas of known sensitive plants and animals, the Plan of Operations will specify ((~~minimum~~)) maximum "corridor" widths ((~~required~~)) allowed for passage of survey and support vehicles. The survey operation will remain inside such a corridor until the area of sensitive species has been traversed. Survey and support vehicles may be required to use "flotation" tires in areas where plant survival is critical. Coordination with the Department of Game regional biologist will be required. Measures recommended by Department of Game may be specified in the Plan of Operations. Such measures could include seasonal restrictions or reducing the number of source points. When a vibratory survey is proposed near known spawning areas, a Department of Fisheries or Game biologist will be consulted and modifications based on Fisheries' or Game's recommendations will be made to the Plan of Operations. [W5, W6, W18]

The alternative (no action) would have no impact.

Energy and Natural Resources:

No significant impacts to nonrenewable or scenic resources are anticipated.

The no-action alternative could inhibit discovery of potential sources of oil and gas, thus reducing the possibility of commercial production for energy uses. (See page 55.)

Built Environment

The no-action alternative would have no impact on the built environment.

Environmental Health:

No significant impacts to environmental health are anticipated. Perceptual impacts may occur. Due to the transitory nature of a Vibroseis survey, these impacts would be of very short duration.

> Mitigation: Timing of vibratory survey activities would be arranged to reduce nuisance to human beings. Offsetting distances would be required to reduce impact on structures and wells.

(See Appendix A for a discussion of noise and other impacts of vibratory exploration.)

Land and Shoreline Use:

Vibratory operations in agricultural areas could cause loss of production due to passage of equipment and personnel.

Concentration of activity at source points could leave depressions and ruts which could impede agricultural activities.

> Mitigation: The Plan of Operations will stipulate requirements for passage of personnel and vehicles through agricultural areas. Alternate routes using existing roads will be considered. If a roadless traverse is planned, the survey contractor shall provide a waiver of damages or compensation to the surface owner or lessee for damages. The Plan of Operations will require that all land surfaces be returned to original contours.

Transportation:

Local vehicular traffic could be impeded by vibratory equipment and support vehicles.

> Mitigation: Timing of vibratory activities would be arranged to reduce activity at peak traffic hours.

Public Services and Utilities:

Roads may be broken or damaged by vibratory surveys and movement of vehicles.

> Mitigation: Survey contractors will be required to post a surety for road damages. Survey vehicles will be required to observe state, county and department road restrictions and weight limitations.

CONVENTIONAL (SHOT-HOLE) SEISMIC

Conventional (shot-hole) seismic refraction and reflection surveys have traditionally used explosive charges as energy sources. An explosive charge is detonated at the bottom of a shallow drillhole; the diameter and depth of the hole, and the size of the charge depend upon local geologic conditions and requirements of the survey. A brief discussion of explosives used by shot-hole contractors and explosive handling requirements are in Appendix B.

The general scheme typical of a shot-hole operation follows. The scheme may be modified in response to survey requirements, climate, topography and time of year. (Northern Geophysical of America, written communication.)

Initial Survey -- A three- or four-person engineering party reconnoiters and surveys the shot-seismic project route. Access routes are flagged and shot-hole and geophone positions are marked for the main seismic crew. Seismic lines are usually surveyed in straight lines to align with the regional trend of the geologic formation being examined. In areas with geographic, topographic or cultural barriers, reflective surveys can tolerate a deviation of up to ¼-mile before the accuracy of the survey will be affected. In a refractive survey, where the seismic line is longer and shot spacing is wider, a deviation of up to one mile is allowable. (USDI, 1981.)

The reconnaissance and survey operations are usually done using one or two four-wheel drive vehicles, road and weather condition permitting. Alternately, equipment and supplies may be transported by foot or horse.

Access and Method -- After the route for the seismic traverse has been surveyed and flagged, access roads are cleared and prepared for use by truck-mounted drilling rigs and support vehicles. Because of increasing expenses associated with seismic surveying, existing roads are followed whenever possible. (F. Tom Ise, Consulting Geologist, personal communication.) In remote areas, roads are built with a minimum amount of earthmoving. In open areas, such as parts of Eastern Washington, road building amounts to removing large rocks and scattered trees. Roadbed preparation is minimal. Roads in Western Washington require more careful attention to construction standards because of soil types and the amount of rainfall. Drill rigs and support vehicles use the same set of tracks which keeps the width of the road to a minimum.

Shot-holes are drilled by truck-mounted equipment, often in a wide spot of the road. The number of drilling rigs used is dependent of the length of the seismic line, the number of holes and the type of survey. Service and water trucks usually accompany the drilling rigs.

Once the shot-holes are drilled, each hole is loaded with an explosive charge and flagged. Drill cuttings, and sometimes gravel, are used to plug the hole directing the energy of the detonation down into the earth instead of up into the atmosphere. Detonation occurs as soon as scheduling of recording equipment allows; however, there may be delays of up to a month. Some shot-holes may be redrilled and shot a number of times to get the best seismic return. After drilling operations are complete, the drilling rigs are removed.

After the drillholes are loaded with explosives, a recording crew arranges pickup cables and geophones along the line of survey. As soon as the recording array is in order, the shots are detonated in a prearranged sequence.

Three examples of shot-hole seismic surveys recently conducted in this state demonstrate the flexibility and wide variation in method and technique. [W18]

- A Shell-Arco joint exploration project in Eastern Washington conducted a seismic reflection survey using 100-foot deep shot-holes. A 15-pound charge was placed in each hole. Access was almost entirely on existing roads. In areas of steep terrain, seismic stations were omitted entirely. (Carl McFarland, personal communication.)

- A seismic refraction survey conducted by the U.S. Geological Survey north of Sunnyside required 8-inch shot-holes drilled to a depth of 140 feet. One ton of explosives was placed in each of four holes. The entire line was 150 miles long. (Edward Criley, USGS, personal communication.)

- An AMOCO Production Company exploration project carried portable drills and back-packed supplies to a reflective survey line in Western Washington. The survey was on forest lands. To preclude damage to the forest, minimal equipment was used. (F. Tom Ise, Consulting Geologist, personal communication.)

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The no-action alternative would have no impacts except those related to locating oil and gas as described in the earlier discussion on page 55.

Road Construction impacts are described in the department's Forest Land Management Program. The Oil and Gas Leasing Program requires conformance with the Road Construction Standards of the Forest Practices Act. (Chapter 222-24 WAC.) These standards were developed to minimize and mitigate road construction impacts on streams and associated resources. Measures described in the Washington Forest Practices Rules and Regulations (Washington State Forest Practices Board, 1982) will be made a part of the Plan of Operations.

Natural Environment

Earth:

Depending on the area traversed by the shot-hole survey crew, soil compaction at drilling points and along access routes could result. Some cratering of the surface could occur, depending on the depth and strength of the explosive charge. The overall degree of impact to soils could be greater than associated with the vibratory method.

Mitigation: Reclamation measures will be prescribed in the Plan of Operations. They may include soil scarification, filling the shot-hole with drill cuttings and gravel and smoothing disturbed areas to original contours to remove most effects of the passage of equipment and detonation.

Air:

Depending on the size and depth of the charge, some dust or gravel may be ejected from the drillhole upon detonation. Some localized odor from the explosive may remain for a short time.

Mitigation: Measures to protect air quality will be determined for each proposed seismic project and made a part of the Plan of Operations. Such measures may include seasonal requirements to compensate for weather patterns. Proximity to population centers and recreation areas will be considered.

Water:

Seismic explosions close to springs and wells may cause changes in water levels or aquifer yield rates.

Mitigation: Buffer areas may be required if the environmental checklist indicates an area of concern. [W11]

Plants and Animals: [W1]

Threatened and endangered plant and animal species may be damaged by the presence of drilling rigs, service trucks and survey personnel.

Depending on vegetative and topographic characteristics of the seismic survey area, debris escaping from the shot-hole could strip leaves and bark from nearby trees or could cover vegetation near the shot-hole.

Resident and migratory animals may be disturbed by the presence of the survey team and equipment. Breeding, nesting, calving and winter ranges may be temporarily disturbed.

Many Washington rivers containing spawning areas (redds) flow through potential oil and gas exploration areas. Anadromous fish embryos could be damaged by acoustic shock generated by seismic exploration activities conducted nearby.

Salmonid embryos are susceptible to damage during a critical period between fertilization and the time the embryo develops eyes (the "eyed" stage). This period begins in November for salmon and in March for steelhead and lasts approximately three to four weeks. Variations in temperature, dissolved oxygen and other factors may advance or retard the attainment of the "eyed" stage. (Paul Hickey, Fisheries Biologist, Muckleshoot Indian Tribe, personal communication.)

Salmon redds in the Nisqually River adjacent to an artillery impact area on the Fort Lewis Army Reservation are of concern to federal biologists. (Jim Stevenson, Fish Biologist, personal communication.)

In Alaska, seasonal restrictions are placed on construction and blasting operations in and near river mouths emptying into Prince William Sound until after the salmonid embryos have attained the "eyed" stage. (Brian Allee, Prince William Sound Aquaculture, personal communication.)

Although the effects of underwater explosives on both marine and freshwater organisms is well-documented in the literature, information regarding the effects on anadromous fish redds from standard drilled shot-holes is notably absent. However, since most seismic charges are placed 100 to 150 feet below the surface and will be offset at least 200 feet from any body of water, the department tentatively concludes that seismic exploration conducted under the proposed policy and current laws and regulations will not cause significant damage to anadromous fish spawning areas.

Mitigation: Natural Heritage and Nongame Program data files will be searched. If the presence of sensitive plant or animal species is indicated, Heritage staff will be consulted for appropriate protection measures. Survey routes, timing and duration may be adjusted to reduce impacts. Protection measures will be made a part of the Plan of Operations.

Coordination with local Department of Game managers will be required for proposed operations on lands leased to the Department of Game. Known areas of breeding or nesting will be identified and the seismic survey schedule may be adjusted to accommodate these critical times. [W6, W18]

A minimum of 200 feet is required between exploration activities and Type 1, 2, 3 or 4 Waters. When a seismic activity is proposed near known spawning areas, a Department of Fisheries or Game biologist will be consulted and modifications based on Fisheries' or Game's recommendations will be made to the Plan of Operations. [W6, W18]

Energy and Natural Resources:

Scenic Resources:

Movement and operation of equipment in arid areas may create dust clouds which could temporarily impair visibility.

Mitigation: Dust abatement chemicals such as ESI-BOND® may be applied to roads to reduce dust. More properly known as an environmental stabilizer, ESI-BOND® was used by Weyerhaeuser Company to control ash during operations near Mt. St. Helens. (Neil Wolbert, Wolbert's Spray Service, Tacoma, WA personal communication.) [W18]

In areas of scenic interest, operations may be timed to avoid daylight or peak visitation hours. Hours of operation could be stipulated in the Plan of Operations.

Built Environment

Environmental Health:

Noise:

The report and concussion associated with explosives used in refractive seismic operations may be a source of nuisance and irritation.

Mitigation: Detonation timing will be conditioned by the Plan of Operations. Charge quantity, shot spacing and proximity of population centers will be considered. Movement of equipment and normal operations may be rescheduled to reduce annoyance in populated areas.

Land and Shoreline Use:

Light and Glare:

Schedules may be adjusted to mitigate noise and dust impacts. Switching to night operation may create impacts from lights.

Mitigation: Scheduling would be arranged to most effectively compensate for impacts. Seismic operations are transitory and of short duration.

Historic and Cultural Preservation:

Seismic exploration lines often traverse distances of tens of miles for one survey. They may bisect or parallel historic or archaeologic sites.

Mitigation: Prior to approval of the Plan of Operations, the appropriate department Area office(s) will ascertain the location of local archaeological or historical sites. If necessary, adjustments to the proposed route will be made in the Plan of Operations.

Agricultural Crops:

Seismic surveys through an agricultural area may cause some destruction of crops and damage to private roads. Compaction, rutting and cratering may occur.

Mitigation: Before a seismic traverse is allowed to cross department-leased agricultural lands, the contractor will be required to reach an agreement with the surface lessee regarding damages. The Plan of Operations will require that the site be returned as close to original conditions as possible before the contractor will be released from the damage agreement. Damages to crops will be compensated according to terms arranged between the surface lessee and the contractor.

Transportation:

The small amount of vehicular traffic generated by a shot-hole seismic traverse will be insignificant and should be easily absorbed by existing road networks.

Public Services and Utilities:

Solid Wastes:

No significant impacts are anticipated. The Plan of Operations requires removal of all solid wastes before the bond or surety is released.

Other Governmental Services and Utilities:

If seismic exploration is performed in the immediate vicinity of public utility facilities, damages could occur.

Mitigation: Seismic exploration requires a Plan of Operations, SEPA compliance and a permit from the Oil and Gas Conservation Committee. The contractor will be required to establish offsetting distance for seismic exploration in accordance with facility design requirements. [W13]

- AIR-SHOT (POULTER) SURVEY (SURFACE EXPLOSIVES)

The air-shot, or Poulter, technique also employs explosives as an energy source, but detonation occurs on or above the ground surface. A Poulter survey is conducted similarly to conventional surveys.

The general layout and spacing of the geophone spread is similar to those for a vibration or conventional operation. Total length of the spread may be up to 5 miles. A total explosive charge of 30 to 60 pounds is used, divided into 2- to 5-pound packages arrayed about the source point in various patterns. The pattern and size of the charge most effective for a particular area is determined by field conditions. The explosives are attached to stakes approximately 3 feet above ground, or laid directly on the ground if disturbance of the vegetation is not critical. After detonation, cables and geophones are picked up and shuttled forward to the next source point. Average progress along the line is 3 to 4 miles per day. [W18]

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The no-action alternative would have no impacts on the Built Environment. See page 55 for impact on Natural Resources.

Natural Environment

Earth:

Soils:

Air-shot detonations may cause craters in the surface soil. Soil compaction from vehicles will occur if the survey is done off existing roads.

Mitigation: Placing the explosives on stakes will partially reduce the impacts to the soil. Filling and reseeding craters will be a required part of the Plan of Operations.

Air:

No significant impact is anticipated.

Water:

No significant impact is anticipated.

Plants and Animals:

Detonation of explosives during an air-shot survey may strip some foliage from nearby brush and trees.

Sequential open-air detonation of approximately 25 to 50 explosive charges per mile would generate a substantial amount of noise and shockwave energy that would carry for distances up to several miles from the detonation point. Although many species exposed to this technique in the past have been observed to be disturbed only momentarily and, in fact, have reoccupied areas adjacent to Poulter shot lines within a few hours following detonation, there is little scientific evidence as to what extent fish and wildlife resources may suffer from this type of disturbance. (USDI, 1983.)

During certain seasons, many species are engaged in reproductive activity and are at the height of their behavioral sensitivity. The noise and shockwaves associated with Poulter survey detonations would potentially disturb a large number of species.

Mitigation: Air-shot surveys may be restricted to areas of sparse vegetation. The impacts are transitory so this kind of restriction will seldom be used.

Impacts could be substantially mitigated by restricting operations to areas devoid of significant wildlife concentrations. Inasmuch as these areas are constantly changing through the year, many areas would be excluded from exploratory activities for relatively short periods of time. Air-shot activities near known sensitive areas will be coordinated with a Department of Game regional biologist. Durational or seasonal restrictions will be made a part of the Plan of Operations.

Energy and Natural Resources:

No significant impacts are anticipated.

Built Environment

Environmental Health:

Noise:

Sequential detonation of explosive charges along a survey line in areas of human activity will be a temporary annoyance. The degree of impact is determined by size of charge, height of charge above the ground, attenuation by wind and the presence of topographic or vegetative screening.

Mitigation: Because of the potentially objectionable effect of air-shot detonations, use of this technique may be restricted or denied in some areas.

Land and Shoreline Use:

Recreation:

Use of air-shot seismic techniques near recreational areas may diminish the recreational experience.

Mitigation: Use of the air-shot method may be conditioned or denied in certain areas and during certain seasons.

Agricultural Crops:

Passage of survey equipment and detonation of air-shots will damage cultivated lands and will temporarily remove the area from production.

Mitigation: Before operations begin, agreement for damages must be reached with the surface user. This agreement will be made a part of the Plan of Operations.

Transportation:

No significant impacts are anticipated.

Public Services and Utilities:

Parks or Other Recreational Facilities:

See discussion under Land and Shoreline Use - Recreation.

STRATIGRAPHIC AND EXPLORATORY DRILLING

Proposed Action:

Oil and gas stratigraphic and exploratory drilling will be allowed on department-managed lands under the following conditions:

- A valid lease is required and
- The lessee must submit a Plan of Operations for approval by the Oil and Gas Conservation Committee and the department prior to commencement of drilling and obtain a drilling permit. (WAC 332-12-360 and 344-12-050.)

Alternatives:

1. Prohibit oil and gas stratigraphic and exploratory drilling on department-managed lands (No Action).

2. Allow stratigraphic drilling but prohibit exploratory drilling on department-managed lands.

3. Restrict stratigraphic and exploratory drilling to certain geographic areas.

4. Restrict exploratory drilling to certain geographic areas.

5. Restrict stratigraphic and exploratory drilling in areas with subterranean facilities. [WI3]

Discussion

Submission of an environmental checklist and a Plan of Operations for department approval prior to issuing a drilling permit will ensure that an environmental analysis of the site has been made.

The no-action alternative is inconsistent with goals adopted by the department and may reduce the likelihood of discovering commercial quantities of oil and gas. See page 55.

Alternative 2 prohibits exploratory drilling, which would eliminate oil and gas exploration and development in Washington. There would be no incentive to explore if the final phase were prohibited.

Under Alternatives 3, ((and)) 4((,)) and 5 impacts on all elements of the environment would be eliminated in certain predetermined geographical areas. In those areas where drilling would be allowed, the impacts would be the same as the proposed action. The Plan of Operations and permits for allowed drilling require completion of the SEPA process. The difference between the proposed action and the alternative is that the proposed action would prohibit actions on a site-specific basis when the need is determined through the SEPA process. The alternative would make the decision for a much larger area, possibly as an administrative decision rather than through the SEPA process.

STRATIGRAPHIC DRILLING

More precise information on geologic structures and stratigraphy near the surface is often required to corroborate information gained through mapping and geophysical surveys. These data are obtained by drilling one or more stratigraphic drill holes ("strat tests"). Stratigraphic tests are defined in the Oil and Gas Conservation Act as being less than 2,000 feet deep.

Stratigraphic drilling is usually accomplished by a truck-mounted drilling apparatus. A water truck and one or two service trucks may accompany the drilling rig.

Drill cuttings are brought to the surface from the bottom of the hole by high pressure air or drilling mud. The depth at which the cuttings were collected

and the rock-type are identified and their age determined. With this information, a key or "marker" bed within the geologic formation penetrated by the hole can be identified. This identification allows correlation of the structure being drilled to a known geologic structure nearby whose characteristics have already been identified.

Very little road building is presently done in Washington for access to stratigraphic drilling sites. Instead, contractors make use of the extensive network of secondary forest management roads already established to reduce both road construction and reclamation costs. (Carl R. McFarland, Geologist, DNR, personal communication)

Rudimentary clearings are used for stratigraphic drilling; the small scale operation requires approximately 1/3 to 1/2 acre. The mud pits are self-contained and portable. Depending upon the drilling condition of the strata penetrated, stratigraphic tests usually require three to seven days of drilling time. After the test is completed the drill hole is plugged and the area reclaimed.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Natural Environment

Earth:

Soil compaction may occur due to movement of machinery and support vehicles.

> Mitigation: Compacted soils will be scarified and reseeded as part of the reclamation requirements of the Plan of Operations. The size of the truck on which the drill rig is mounted encourages use of drilling locations on wide shoulders and turn outs of secondary roads and small clearings. Such use will be encouraged in the Plan of Operations.

Air:

No significant impact to this element is anticipated.

Water:

Surface Water Quantity: [W18]

Surface water may be required to cool drilling and auxiliary equipment, for make-up of drilling fluid and for potable water. Small amounts of surface water may be used for cooling power plants, generators and wash-down purposes.

The amount of surface water necessary as a base for drilling fluid is dependent upon depth and diameter of the drill hole and the physical and chemical make-up of the geologic strata encountered during drilling. Surface water requirements may vary from several gallons per minute during normal operations, to 100 or more gallons per minute for brief periods if circulation of drilling fluid is lost.

Depending upon proximity of water sources, water for the drilling operation may be hauled or piped from a stream or surface body of water. In some instances, water levels will be lower or flows reduced.

Mitigation: Withdrawal from surface water sources requires a permit from the Department of Ecology.

Surface Water Quality: [W4, W5]

Quantities of water produced in the drilling process may require disposal into a stream or surface body of water.

Mitigation: Surface disposal of water produced during drilling operation must be consistent with Water Pollution Control Act standards. Water protection procedures, as prescribed by the Oil and Gas Conservation Act (WAC 344-12-080), and Department of Ecology regulations (Chapters 173-216 and -303 WAC) will become part of the site-specific Plan of Operations.

The SEPA and Sensitive Area Planning processes may determine that lands containing public water sources will not be leased. [WI4, WI5]

Runoff/Absorption: [W4]

Exploratory drilling itself will not impact runoff. Spills or leakage from stored bulk drilling mud materials may be absorbed and concentrated in the underlying soil.

Mitigation: Storage of bulk drilling mud materials will be done only in an approved area. The storage site will be surfaced with an impermeable cover. A containment berm surrounding the storage area will be required. Muds designated dangerous waste (Chapter 173-303 WAC) may require special handling on-site.

Ground Water Quality:

Drilling may allow communication between aquifers of different water quality. Quantities of brine may be produced in the drilling process.

Mitigation: Proper aquifer protection procedures as prescribed by the Oil and Gas Conservation Act (WAC 344-12-080), Department of Ecology regulations (Chapter 173-160 WAC) and other local regulations will become part of the site-specific Plan of Operations. These requirements include sealing off strata and cementing well casings. [H3, W11, W16]

Brine must be disposed of consistent with DOE standards, which require injection into an aquifer of equal or lesser quality or may require special handling on-site or while in transit, and disposal in a designated area approved by DOE. [W4, WI6]

The SEPA and Sensitive Area Planning processes may determine that lands containing public water sources will not be leased. [W7, W9, W11, W15]

Plants and Animals:

Crushing or obliteration of vegetation may occur around the drill rig.

Stratigraphic drilling operations may disturb animal breeding, nesting or calving areas for a short time.

Mitigation: Stratigraphic drilling requires a Plan of Operations, SEPA compliance and a drilling permit from the Oil and Gas Conservation Committee. Some damage to vegetation around the drill site will be unavoidable. The drilling contractor will be required to compensate surface lessees for any damages sustained. Reclamation of obliterated areas will be required as a part of the Plan of Operations. Drilling activities in areas identified as critical habitat will be restricted or curtailed on a site- or time-specific basis. Impacts to wildlife would be minimized by coordinating exploration activities so they would not coincide with breeding, nesting or calving activities, or wintering areas. [W1]

Energy and Natural Resources:

No impacts to these elements are anticipated.

Built Environment

Environmental Health:

Noise:

Noise associated with the drilling operation and support vehicles may be a nuisance in populated areas.

Mitigation: Drilling and related activities may be restricted to daylight hours to reduce the nuisance factor. [W11]

Release of Toxic Gases:

Hydrogen sulfide (H_2S) may be encountered in dangerous quantities during drilling.

Mitigation: Hydrogen sulfide detectors are required to be a part of every well drilling rig in areas suspected or known to contain hydrogen sulfide gas. (WAC 334-12-098(2).) See Exploratory Drilling.

Land and Shoreline Use:

Existing Land Use:

Drilling will be restricted or denied as stated in the department's Aquatic Land and Water and Wetlands policies (see pages 14 and 15).

Mitigation: There are no mitigating measures.

Light and Glare:

If round-the-clock operations are conducted, light and glare from illuminated sources may become a nuisance in populated areas.

Mitigation: If light and glare is a nuisance, glare shields may be required on drilling apparatus. Hours of work may be restricted to daylight hours.

Agricultural Crops:

If stratigraphic drilling rigs cross cultivated lands, some crops will be destroyed.

Mitigation: Prior to crossing a planted area, the drilling contractor must reach an agreement with the surface lessee regarding damages. The use of existing roads or tracks will be encouraged whenever possible.

Transportation:

No significant impacts are anticipated.

Public Services and Utilities:

((~~No significant impacts are anticipated.~~))

Other Governmental Services and Utilities:

If stratigraphic drilling is performed in the immediate vicinity of public utility facilities, damages could occur.

Mitigation: Stratigraphic drilling requires a Plan of Operations, SEPA compliance and a permit from the Oil and Gas Conservation Committee. The contractor will be required to establish offsetting distance for stratigraphic drilling in accordance with facility design requirements. [W13]

EXPLORATORY DRILLING

Within the continental United States, about 1 out of every 16 exploratory (wildcat) wells yield significant production during their life (100,000 barrels of oil or 1 trillion cubic feet of gas). Only about 1 out of every 140 wells produce enough to be considered a financial success (USDI, 1981c). Many upland and aquatic areas in Washington have been identified as containing the geologic requirements for accumulation of commercial quantities of oil or gas. Although over 435 exploratory wells have been drilled in Washington to date, there has been no commercial production. It has been estimated that there has been only one exploratory well for every 200 square miles of favorable area.

If data from geologic mapping, geophysical surveys and stratigraphic tests still indicate favorable structures or formations are present, exploratory drilling is

generally the next step in the evaluation process. A lease is obtained and a Plan of Operations is submitted. It must be emphasized that the decision to drill an exploratory well in Washington requires a commitment of several million dollars and possibly a year's time, with absolutely no guarantee that the final result will be a producing well.

A representative sequence of events followed in drilling an exploratory well follows. First, an access route to the well site must be built. Usually, existing roads are improved as required to withstand heavy-equipment vehicle weights. If a new road must be constructed, it is designed to accommodate heavy load-bearing equipment and almost continuous traffic. Turnouts are required at regular intervals. In uneven or mountainous terrain, cut and fill slopes are necessary. Other factors which could influence road construction are expected duration of drilling activity, availability of water, season, climate and topography. The department may specify a route and design which could serve as access to future timber sales.

At the well site, a drill pad is cleared, graded, leveled and graveled and a reserve mud pit excavated. A pad will cover from two to four acres, depending on topography, slope, drainage characteristics and the permitted depth of the well. Deep wells ((~~15,000~~)) (9,000 feet or more) require a proportionately larger site. Most of the larger area is occupied by the larger reserve pit, chemical storage and drill pipe storage.

After the drill pad is finished, the drill rig and support facilities such as equipment storage sheds, office trailers, and sanitary facilities are erected. The large amount of equipment needed for a drill rig is hauled in on flat bed trucks and assembled on the drill pad. For example, the AMOCO well drilled near the Wynoochee River in Western Washington required 72 low-boy semi-trucks and trailers to transport the rig and support facilities (Neil Thurgood, AMOCO Production Company, personal communication).

Once drilling begins, the operation continues 24 hours a day. The duration of drilling operations is influenced by many factors, such as depth, geologic characteristics of the formation, type, size and condition of the drilling rig and difficulties encountered in drilling. An exploratory well may require up to nine months to complete; testing with a smaller "work over" rig could take three to six months longer.

A major concern during the drilling operation is the possibility of a "blowout". A blowout occurs when the pressure of the formation being penetrated exceeds the pressure exerted by the column of drilling mud and there is no time to increase mud weight or actuate the blowout prevention equipment (BOPE). Many wells will give definite warnings that a blowout is imminent and appropriate preventative measures are taken. Exploratory wells in Washington are required by the Oil and Gas Conservation Act (WAC 344-12-092) to have BOPE installed and ready for use until drilling ceases. Statistics compiled between 1970 and 1980 for California wells show that of 24,800 wells drilled, only six blowouts occurred during drilling operations (USDA, 1981).

If commercial quantities of oil or gas are found, the exploratory well will be modified to serve as a production well. Such modifications are strictly controlled by statute.

If the wildcat well does not result in discovery of commercial quantities of oil and gas, the well is plugged and abandoned. The site is reclaimed according to the specifications of the Plan of Operations.

· DRILL PAD CONSTRUCTION AND DRILL RIG ASSEMBLY

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Road construction impacts are discussed under the policy for Road Construction.

Natural Environment

Earth:

Soils:

Clearing and leveling a drill pad and excavation of the reserve mud pit will remove some or all of the top soil.

The soil will be deliberately compacted to provide a stable base for the drilling rig. The degree of irreversible damage from compaction is dependent on the type of soil encountered on the site. "Bearing strength" of the soil is a determining factor. If sufficient bearing strength cannot be achieved by compaction, pilings will be used to prevent possible rig tip over.

Mitigation: Soil removed will be stockpiled and replaced at the conclusion of operations. Areas of slide-prone soils will be avoided. At the conclusion of operations, the site will be scarified to reverse compaction and the stockpiled topsoil spread on the site. Some permanent compaction is unavoidable.

Topography:

Clearing and leveling the drill site will alter the topography of the local area.

Mitigation: Natural clearings and level areas will be used whenever possible.

Air:

Drill pad construction will create dust. The amount of particulate concentration will depend on weather conditions and soil type. Drill rig construction will dramatically increase traffic and therefore could increase particulates in the air. Drill pad construction and drilling rig assembly normally takes about two weeks, so impacts will be of short duration.

Mitigation: Compliance with local air quality standards will be required. In areas where dust will cause visibility or health problems, dust abatement measures such as sprinkling or use of environmental stabilizers will be required in the Plan of Operations. [W18]

Water:

Depending on soil type, surface permeability and topography, runoff may occur during heavy rainfall. Due to the nature of the operations, runoff may be contaminated with both toxic and nontoxic elements such as oil and sediments.

Mitigation: Site-specific requirements to contain runoff will be part of the Plan of Operations. These may include settling ponds or catchment basins. The Plan of Operations will also require compliance with State Department of Ecology ((~~water-standards~~)) regulations (Chapters 173-201, -240, -303 WAC). Water-permeable surfacing on the drill pad may also be required. [W4]

Plants and Animals:

Impacts on sensitive plant and animal species are discussed in the Resource Protection section. See also the discussion in the FLMP EIS (DNR, 1983b) and the Natural Heritage Plan (DNR, 1983c).

Clearing and leveling will destroy existing vegetation.

Animal habitat for several acres will be altered, disturbed or destroyed. Small burrowing mammals with established residency will be impacted most. Larger, more transient animals will have to relocate. During drill rig construction, the large amount of traffic may temporarily increase road kill.

Mitigation: The Plan of Operations will require that drill pads be located to minimize impacts on game breeding, nesting, calving and wintering habitat. Native plants and grasses will be planted on the site at the conclusion of operations. Animals will quickly return to the site and re-establish residency after abandonment. The Plan of Operations may stipulate specific reclamation measures to reduce long-term disruption of habitat. [W1]

Energy and Natural Resources:

Exploratory drilling sites located away from major fuel and lubricant distribution points could temporarily affect local supplies of fuel and lubricants.

Mitigation: Supply procurement will be the responsibility of the operator.

Built Environment

Environmental Health:

Noise: [W11]

Equipment used to clear the drill pad site will create noise. There are two types of noise environments on state lands: (1) those in remote locations, generally inaccessible to the public and influenced by few, if any, human sources of noise; and (2) those closer to human population and subject to various human-generated sound (e.g., traffic, aircraft, trains, industries, and residential uses). Most department-managed lands fall into the first category.

Ambient or background noise levels are commonly 20 to 35 dBA[1] in remote locations. Wind blowing through the treetops, rustling leaves and branches, moving water, rainfall, wildlife and even insects are examples.

Noise level predictions for a particular reception point depend on: 1) noise intensity, 2) distance and barriers between the source and reception point, and 3) weather conditions such as temperature, humidity, wind direction and speed. Because of the complexity of sound propagation, noise level predictions do not consider obstacles or wind. However, varying terrain and the presence of obstacles or barriers would reduce noise levels.

The lowest background level measured on state forest land is 27 dBA. This was in a forest devoid of mechanical or other noise generated by man. Averaging 21 measurements of ambient levels made in "quiet forests" on state land, a value of 34 dBA was determined. (DNR, 1983b.)

WAC 173-60-040 establishes the maximum permissible environmental noise level based on three classes determined by typical uses.

- Class A EDNA - includes residential (single and multiple family), recreation and community services.
- Class B EDNA - involves uses requiring protection against noise interference with speech.
- Class C EDNA - includes economic activities with higher noise levels. The maximum permissible noise level between 7:00 a.m. and 10:00 p.m. in Class A is less than or equal to 55 dBA. The noise limitations are reduced by 10 dBA between 10:00 p.m. and 7:00 a.m.

Noise limitation is established by the Washington State Department of Ecology (Table 1).

Table 1 Noise Limitations Established by Washington State Department of Ecology

EDNA* of: Noise Source	EDNA of Receiving Property		
	Class A	Class B	Class C
Class A†	55 dBA	57 dBA	60 dBA
Class B**	57	60	65
Class C††	60	65	70

* Environmental Designation for Noise Abatement.
† Generally residential areas
** Generally commercial areas
†† Generally industrial areas

Noise levels of typical equipment range from 79 dBA (at 50 feet) for a front loader to 101 dBA for a pile driver. These noise levels are all beyond the DOE limitations. However, DOE exempts noises emanating from temporary construction sites as a result of construction activity except in Class A areas (WAC 173-60-050).

Mitigation: Construction activities will be restricted to daylight hours in Class A areas. Additional work hour restrictions may be imposed by site-specific Plans of Operations. Construction noise is temporary.

Land and Shoreline Use:

Existing Land Use:

Approximately two to four acres are required for construction of a drill pad large enough to accommodate a rig capable of drilling 9,000 feet. Deeper wells require a larger drill pad area because of larger reserve mud pits and material handling areas.

Aesthetics:

Drill pad construction and drill rig assembly may be considered unattractive.

Mitigation: Topographic and vegetative screening may be used in areas where the drill site is obtrusive. These measures may be required as needed in the Plan of Operations.

Agricultural Crops:

Drill pad construction will remove approximately two to four acres of land from agricultural and forest production until the site is abandoned. Farm equipment movement may be impeded or restricted.

Mitigation: Prior to construction the lessee or contractor must reach an agreement on payment for damages. Timber must be appraised and paid for. If the well is nonproductive, the drill site will be returned to its original condition as stipulated in the Plan of Operations.

Transportation:

The site chosen for the drill pad may create local traffic problems. In some areas the drill site may bisect a local road. Moving personnel, equipment and

supplies across the road may cause a temporary hazard and impediment to local traffic. Local recreationists, in particular motorcyclists, may be accustomed to using the area for off-road vehicle riding. Mud pits and sediment ponds may create a hazard.

Mitigation: Caution signs and other warning devices will be used as necessary to warn motorists of hazards. Pits and ponds will be signed and fenced as needed to prevent accidents.

Public Services and Utilities:

Solid and liquid wastes and trash accumulations in the drill pad construction area could pose a health hazard and be an "attractive nuisance".

Mitigation: All wastes generated by drill pad and drill rig construction and assembly will be disposed of in a manner consistent with local ordinances and health regulations.

Range/Forest Fire Hazard:

Clearing of the drill pad site will create brush and slash accumulations that could constitute a fire hazard under certain conditions. Drill sites in high grass range areas also create the possibility of a range fire.

Mitigation: Any rubbish or debris that might constitute a fire hazard must be moved at least 100 feet from the well location (WAC 344-12-095). Site-specific Plans of Operations may require additional fire protection measures. These may include filing a contingency fire plan with the local fire district, stationing fire-fighting equipment on the site and carrying basic fire tools in all equipment.

· DRILLING

The longest lasting phase of the Oil and Gas Leasing Program is exploratory drilling. This phase also evokes the most concern. Impacts involve both surface and subsurface elements of the environment.

Natural Environment

Earth:

No significant impacts are anticipated.

Air:

Emissions from diesel and gasoline engines used to generate electricity will impact air quality in the local area. Dust and emissions from vehicle traffic

will be much less than in earlier phases (see Transportation). Temporary atmospheric inversions could cause dangerous concentrations of emissions.

Mitigation: Normal air movements will disperse emissions. If an inversion occurs, engine operation will be restricted or stopped until normal air patterns return.

Water:

Surface Water Quantity: See earlier discussions for impact and mitigation under STRATIGRAPHIC DRILLING.

Surface Water Quality: See earlier discussions for impact and mitigation under STRATIGRAPHIC DRILLING. [W5, WI5]

Runoff/Absorption:

Exploratory drilling itself will not impact runoff. Spills or leakage from stored bulk drilling mud materials may be absorbed and concentrated in the underlying soil.

Mitigation: Storage of bulk drilling mud materials will be done only in an approved area. The storage site will be surfaced with an impermeable cover. A containment berm surrounding the storage area will be required. Muds designated dangerous waste (Chapter 173-303 WAC) may require special handling while on-site or in transit. [W4, WI5]

(See ((~~also~~)) earlier discussions for impacts and mitigation ((~~from drill pad construction~~)) under DRILL PAD CONSTRUCTION AND DRILL RIG ASSEMBLY.)

Ground Water Quantity:

Water is required to cool drilling and auxiliary equipment, as part of the drilling fluid and for potable water. Small amounts of water are used for cooling power plants, generators and wash down purposes.

Amount of water necessary as a base for drilling fluid is dependent on depth and diameter of the drill hole and the physical and chemical makeup of the geologic strata encountered during drilling. The amount of water necessary may vary from several gallons per minute during normal operations, to 100 or more gallons per minute for brief periods if circulation of drilling fluid is lost.

Depending upon proximity to established water sources, water for the drilling operation may be hauled or piped in from an outside source. In some instances, a water well may be drilled at the site; if so, quantities of water in local aquifers may be reduced.

Mitigation: Withdrawal of surface or ground water requires a permit from the Department of Ecology. Permission from the local municipality may also be required. [WI1]

Ground Water Quality:

Drilling may allow communication between aquifers of different water quality. Quantities of brine may be produced in the drilling process.

Mitigation: Proper aquifer protection procedures as prescribed by the Oil and Gas Conservation Act (WAC 344-12-080), Department of Ecology regulations (Chapter 173-160 WAC) and other local regulations will become part of the site-specific Plan of Operations. These requirements include sealing off strata and cementing well casings. [W3, W9, W11]

Brine must be disposed of consistent with DOE standards, which require injection into an aquifer of equal or lesser quality or may require special handling on-site or while in transit, and disposal in a designated area approved by DOE. [W4, W9, W16]

The SEPA and Sensitive Area Planning processes may determine that lands containing public water sources will not be leased. [W7, W14, W15]

Plants and Animals:

The reserve mud pit and settlement ponds may pose a hazard to some animals and birds, particularly water fowl. They may land on or drink contaminated water. In some areas the drilling rig may obstruct migratory bird flyways. Birds have been killed by flying into the rig.

Noises occurring during operations may frighten animals, however most will have already left the area because of the noise caused by drill pad construction.

Mitigation: The mud pit and settlement ponds may be fenced. Devices to frighten birds may be attached to the drill rig, but they are not always successful. Netting may be used over the mud pit and settlement ponds. Once the drilling operation ceases and reclamation is complete, the animals will likely come back. [W6]

Energy and Natural Resources:

Source/Availability:

Depending on fuel and lubricant requirements and proximity to major distribution centers, demand from the exploration project may reduce local supplies. The majority of potential areas in the state are close enough to bulk distribution plants that long-term shortages are not anticipated.

Scenic Resources:

The presence of the drill rig in certain areas may impair long-range or extended vistas.

Mitigation: Topographic and vegetative screening may help but total reduction of impacts is not feasible.

Siting of drilling locations to offset impacts will be required through the Plan of Operations.

Built Environment

Environmental Health:

Noise:

The primary noise during this phase is from diesel engines and generators associated with drilling rigs. Noise levels varying from 72 to 80 dBA could continue day and night. Under usual operations Washington State ambient noise standards will be violated in Class A EDNAs.

Sharp, short-duration noise impulses will occur when drill bits are changed or sections of drill pipe are added.

Mitigation: Construction activities in Class A EDNAs may be restricted to daylight hours. In areas of noise sensitivity (such as residential areas) generators may be placed in buildings and drilling rigs insulated. Topographic and vegetative barriers may also be used to deaden noises. [W11]

Release of Toxic Gases or Materials:

Drilling operations may encounter pockets of hydrogen sulfide (H_2S). This gas, with its characteristic smell of rotten eggs, is easily detected long before lethal concentrations are reached. (See Table 2.)

Leaking fuel tanks or coolant reservoirs on power generators may contaminate the soil. Drilling mud in the reserve pit may spill over the containment berm during periods of high precipitation. Blowout of the well will cause a sudden release of mud ((or)) and gases or oil into the atmosphere and such substances will be deposited in the immediate vicinity of the drill site. Substances can flow from the well site unless contained. [W9]

Accidental oil or chemical spills may occur during the transport and handling of the materials at the drilling site. [W15]

Mitigation: Present state-of-the-art warning devices give audible and visible indications of H_2S presence in the drilling mud at levels far below human detection. Such warning devices are required in areas where hydrogen sulfide gas is known or suspected (WAC 344-12-098(2)).

Blowout prevention equipment is required by the Oil and Gas Conservation Act (WAC 344-12-092). Regular testing and maintenance are also required.

All stationary engines will have catch-pans or impermeable barriers beneath them to keep contaminants from the soil.

A contingency plan for containment of both mud pit materials and chemicals used in mud control techniques and accidental oil spills will be part of the Plan of Operations. [W15]

A contingency plan for containment of blowout substances will be part of the Plan of Operations. [W9]

Table 2 Hydrogen Sulfide Toxicity.

Concentration	Reactions
10 ppm[1] = .001%	Normal sense of smell can detect this level of concentration.
20 ppm = .002	Safe for 8 hours exposure.
100 ppm = .01	Sense of smell is killed in 3 to 15 minutes, may sting eyes and throat.
200 ppm = .02	Sense of smell is killed shortly. Stings eyes and throat.
D E A D L Y R A N G E:	
500 ppm = .05	Loss of sense of reasoning and balance, occurs along with respiratory paralysis in 30 to 45 minutes; needs prompt artificial resuscitation.
700 ppm = .07	Victim will become unconscious quickly (15 minutes maximum). Breathing will stop and death results if not rescued promptly: immediate artificial resuscitation required.
1,000 ppm = .10	Unconscious at once. Permanent brain damage could result unless promptly rescued.

[1] Parts per million

Land and Shoreline Use:

Existing Land Use:

Drilling will be restricted or denied as stated in the department's Aquatic Land and Water and Wetlands policies (see pages 14 and 15).

Mitigation: There are no mitigating measures.

Population:

Little impact on the state as a whole would occur as a result of exploratory drilling. During the past ten years, a maximum of four exploratory drilling

rigs were in operation during any one year. The cumulative total of all out-of-state personnel involved in such activities, including operators, drilling rig and support personnel, probably did not exceed 50 persons.

Due to a lack of experienced oil drilling personnel in the state labor market, very few local persons are hired during this phase; most positions are filled by out-of-state personnel. Due to the relatively short duration of activities, most do not bring their families. They rely on local motels, hotels and trailer parks for housing. Community facilities near the exploration activities will experience very little impact.

Mitigation: Local residents will be hired as much as possible.

Light and Glare:

Round-the-clock drilling will require the use of quartz-halogen or mercury vapor lights. Glare from these lights could be annoying in residential or recreational areas.

Mitigation: Light and glare from night operations may be reduced by use of topographic or vegetative barriers. Man-made screening may also be required.

Aesthetics:

The presence of the drilling apparatus may be unattractive to some viewers.

Mitigation: Efforts will be made to keep the drill site clean and orderly. If commercial quantities of oil or gas are not found, the drilling apparatus will be removed.

Transportation:

Vehicular Traffic:

Traffic associated with the operation, including supply deliveries, shift changes and the curious, may impede or congest local traffic occasionally. Traffic during the night may be annoying to nearby residents.

Mitigation: Supply traffic may be restricted to nonpeak hours. Local traffic rules and restrictions will be observed.

Public Services and Utilities:

Fire:

Failure of the blowout prevention equipment coincidental with a blowout could release flammable gases into the atmosphere.

Mitigation: Regular maintenance of blowout prevention equipment and careful storage of flammable materials will virtually eliminate the chance of fire. A fire contingency plan will be required in the Plan of Operations.

Solid Waste:

Waste materials generated at the drill site include:

1. Solid waste (cement and drilling mud containers, damaged circulating water and mud pump hosing, damaged drilling rig equipment, e.g. casing, drill rods, tools, etc.);

2. Liquid waste (drilling fluid, oil and grease); and

3. Sanitary wastes.

All solid wastes are collected in closed containers and disposed of at a site approved by the state or local agency responsible for waste disposal operations.

Under normal operating conditions the drilling fluid circulates in a closed cycle and there is no intentional discharge of the fluid. At the termination of drilling activities or during changes in drilling fluid composition, it is sometimes necessary to dispose of some quantities of drilling fluid. The liquid waste is returned by injection under controlled conditions to subsurface strata containing water of equal or poorer quality, subject to approval of the state. Dependent upon local evaporation rates, drilling fluids may be permitted to evaporate from the mud pit or to seep into subsurface layers, if approved. When prescribed by state or local agencies, liquid wastes are collected in closed containers and disposed of at a site approved by DOE. (After drilling is complete, the mud pits are back-filled, covered with top soil, and graded and reseeded in accordance with the intended use of the site. Recovery rate of the reclaimed site is dependent upon local climatic conditions.)

Portable sanitary units are used to accommodate personnel at the site. These wastes are also disposed of off-site at approved locations.

Mitigation: No further mitigation measures are needed.

Other Governmental Services and Utilities:

If exploratory drilling is performed in the immediate vicinity of public utility facilities, damages could occur.

Mitigation: Exploratory drilling requires a Plan of Operations, SEPA compliance and a permit from the Oil and Gas Conservation Committee. The contractor will be required to establish offsetting distance for exploratory drilling in accordance with facility design requirements. [W13]

RECLAMATION [W10]

Reclamation of areas subject to damages through disturbances from activities allowable under the Oil and Gas Leasing Program is mandatory. Reclamation requirements of each lease will consider the site-specific conditions present on each tract. These requirements will be included in the approved Plan of Operations.

Upon completion of permitted activities, the lessee or contractor shall remove all equipment, structures and facilities, unless otherwise approved by the Lands Division and the Oil and Gas Supervisor (WAC 344-12-145). A final inspection will be made of the property to ensure that reclamation measures under the approved Plan of Operations have been followed. Termination of the lease or permit and release of surety is contingent upon acceptance by the Oil and Gas Supervisor of plugging and abandonment of work and acceptance by the department of the quality of reclamation (WAC 332-12-380 and -420).

Reclamation requirements may include (but are not limited to) the following mitigation measures. Reclamation measures unique to a particular area will be outlined in the Plan of Operations as a site-specific requirement.

- Filling, recontouring and replacement of topsoil and revegetation of reserve mud pits and drilling sites
- Obliteration and revegetation of temporary access roads [W18]
- Replanting or compensating the surface lessee or owner for agricultural crops or forest products
- Repairs to bridges, culverts, roads, overpasses, cattleguards and fences
- Scarification of soils compacted or rutted by vehicular movement
- Recontouring and replanting of areas where topography has been modified or vegetation removed
- Disposal of contaminated soils, water and drilling mud in approved dumping areas
- Sealing strata containing noxious or toxic gases
- Cementation of potentially usable aquifers
- Proper plugging and abandonment of stratigraphic test holes, seismic shot-holes or exploratory drill holes
- Replacement of fish, animal or bird habitat destroyed or modified by exploratory activities
- Re-establishment of all or portions of roads and trails [W18]
- Clean up of all trash and debris generated at exploration sites

GLOSSARY

GLOSSARY

Abandon: To cease producing oil and gas from a well when it becomes unprofitable. Different steps may be involved in abandonment: Part of the casing may be removed and salvaged; one or more cement plugs may be placed in the bore hole to prevent migration of fluids between the different formations penetrated by the bore hole; and the well is abandoned.

Aquatic Lands: All state-owned tidelands, shorelands, harbor areas and the beds of navigable water.

Blowout: An uncontrolled flow of gas, oil or other well fluids into the atmosphere. A blowout occurs when formation pressure exceeds the pressure applied to it by the column of drilling fluid.

Blowout Prevention Equipment: One of several systems of valves installed at the well head to prevent the escape of pressure either in the annular space between the casing and drill pipe or an open hole. Also referred to as BOPE.

Bonus Bid: An offer, oral or sealed, by an interested person to acquire a lease. Bids are accepted as a one-time payment and must be in excess of the minimum annual rental.

Casing: Steel pipe placed in an oil or gas well as drilling progresses to prevent the wall of the hole from caving in during drilling and to provide a means for extracting oil and gas if the well is productive.

Casing String: The entire length of all the joints of casing run into a well.

Cementing: The application of a liquid slurry of cement and water to various points inside or outside the casing.

Christmas Tree: The control valves, pressure gauges and chokes assembled at the top of a well to control the flow of oil and gas after the well has been drilled and completed.

Condensate: The liquid hydrocarbons recovered at the surface that result from condensation due to reduced pressure or temperature of the hydrocarbons existing in a gaseous phase in the reservoir.

Conductor Pipe: A short string of large-diameter casing used to keep the top of the well bore open and to provide a means of conveying the up-flowing drilling fluid from the well bore to the mud pit.

Cuttings: The fragments of rock dislodged by the bit and brought to the surface by the drilling mud.

Development: Work which generally occurs after exploration and furthers bringing in production, including defining the extent of the oil and gas resources and construction of support facilities.

Development Unit: The maximum area of a pool which may be drained efficiently and economically by one well.

Development Well: 1) A well drilled within a known or proven productive area of an oil or gas field. (2) A well drilled to permit more effective extraction of oil and gas from a reservoir.

Directional Drilling: Intentional deviation of a well bore from the vertical. It is sometimes necessary or advantageous to drill at an angle from the vertical. Controlled directional drilling makes it possible to reach subsurface areas remote from the point where the bit enters the earth.

Drilling Fluid: A fluid circulated within the wellbore from the surface. Usually a mixture of clay, water and other chemical additives. Air, gas or water can be used as drilling fluid.

Drill String: The column or string of drill pipe with attached joints that transmit drilling fluid and rotational power to the drill bit.

Exploration: The investigation of oil and gas resources by any geological, geophysical, geochemical or other suitable means.

Gas Lift: Any method used to lift liquid to the surface by injecting gas into the well bore from which production is obtained.

Gravity Survey: Measurements of the gravitational field at a series of different locations.

Grouting: See Cementing.

Hydrocarbons: Organic compounds of hydrogen and carbon.

Igneous: Those rocks formed by solidification from a molten or partially molten state.

Lithology: A description of rocks on the basis of such characteristics as color, mineralogic composition and grain size.

Log: A continuous record as a function of depth of observations (electrical, geophysical, geochemical) or well cuttings of the rock, exposed in a well bore.

Magnetic Survey: Measurement of a component or element of the geomagnetic field at different locations.

Magnetotelluric Survey: An electromagnetic method of surveying in which natural electric and magnetic fields are measured.

Metamorphic Rock: Those rocks formed in the solid state by pronounced changes of temperature, pressure and chemical environments.

Permeability: A measure of the ability of fluids or gas to diffuse or pass through a porous rock.

Plugging: To place cement or mechanical plugs into a well at specified intervals to prevent contamination of freshwater or oil and gas zones; or to prevent the interzone migration of fluids.

Pool: An underground reservoir containing a common accumulation of oil or gas, or both. Each zone of a structure which is completely separated from any other zone in the same structure such that the accumulations of oil or gas are not common with each other is considered a separate pool and is covered by the term "pool".

Porosity: The ratio of the volume of spaces in a material to the volume of its mass.

Production: Extracting oil and/or gas in paying quantities.

Reclamation: The reasonable protection and rehabilitation of all land subject to disruption from exploration, development and production of an oil and gas resource.

Reserve Pit: A waste pit, usually an excavated earthen-walled pit. It may be lined with plastic or other impervious materials to prevent contamination of the soil.

Reservoir: A section of porous and permeable sedimentary rock containing commercial quantities of oil or gas.

Sedimentary: Those rocks formed of fragments of other rock deposited by wind or water.

Separator: Apparatus used for separating oil, gas, water, etc., as it is produced.

Shot Hole: In seismic prospecting a bore hole in which an explosive is placed for generating seismic waves.

Shows: A trace of oil or gas detected in a core, cuttings or circulated drilling fluid; or interpreted from electrical or geophysical logs run in a well.

Stratigraphic Test or Well: A hole drilled to obtain information on the thickness, lithology, sequence, porosity, permeability and age of the rock penetrated. Frequently drilled to evaluate a potentially productive oil or gas zone.

Surface Pipe: The first string of casing (after the conductor pipe) that is set in a well, varying in length from a few hundred to several thousand feet. Some states require a minimum length to protect fresh water sources.

Tank Battery: A group or collection of tanks located at convenient points for storing oil prior to transporting by truck or pipeline.

Treater: Mechanical equipment used to separate oil from water.

Wetlands: Those areas extending landward for 200 feet in all directions as measured on a horizontal plane from the ordinary high water mark; all marshes, bays, swamps, floodways, river deltas and flood plains associated with or influenced by any stream, river, lake or tidal water; or any combination thereof.

Wildcat Well: An exploratory well drilled for oil or gas on a geologic feature not yet proven to be productive, in an unproven territory or to a zone that has never produced or has not been known to be productive in the general area.

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APPENDICES

APPENDIX A

EFFECTS ON ELEMENTS OF THE ENVIRONMENT DUE TO VIBROSEIS® SURVEY OPERATIONS

Conclusions from studies, reports and interoffice memos kindly supplied by the International Association of Geophysical Contractors strongly suggest that the pulsating inputs of energy to the earth's surface which are the basis of the Vibroseis® principle cause no damage to structures or wells if certain offsetting distances are observed. Nuisance to human beings may be regarded as slight to moderate, depending upon the receptor and distance from vibration source.

Duvall and Fogelson[1] did a statistical analysis of the data collected by several experimenters. They came to the conclusion that particle velocity was the physical quantity most indicative of the resulting damage. They also concluded that 2.0 inches per second of particle velocity was a reasonable threshold between the "safe" zone and the "damage" zone. Other authors indicate that 4.0 inches per second is the threshold and define a caution zone between 2.0 and 4.0 inches per second in which minor damage may occur. Recent evidence from the study of the long wavetrain energy indicates that the caution zone should start at 1.0 inches per second or slightly below. Most authors define "damage" as minor plaster cracks or further opening of existing cracks.

In a study which evaluated both nuisance to humans and damage potential resulting from vibrator vehicles, the following summary table was developed by a Vancouver, B.C. engineering consultant.

Table 1

Vibration Equipment*	Distance (Feet)	Peak Particle Velocity (Inches per Second)
April 27, 1977		
1 Vibrator Unit	50	.08
	50	.07
	50	.11
April 28, 1977		
4 Vibrator Units	25	.36
	25	.40
	25	.57
	50	.30
	50	.20
	50	.19

* Vehicle weights not given

Source: R. M. Hardy and Associates, Ltd., written communication to Thurston Consultants, Ltd., (both of Vancouver, B.C.)

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1 Duvall, W. I. and Fogelson, D. E., "Review of Criteria for Estimating Damage to Residences from Blasting Vibrations", Bureau of Mines Report, RI 5968, (1962).

The table shows that a considerable increase in the peak particle velocity occurs by adding the additional vibrator units. The study corroborated the Duvall and Fogelson conclusion (mentioned previously) by saying, "Peak particle velocity is considered the best measure of damage potential from vibration and it is generally accepted in the industry that a peak particle velocity of 2.0 inches (5 centimeters) per second is a reasonable and safe limit below which damage to buildings is not expected. The safe criteria is well documented in the literature and is a conservative figure to preclude damage to structures."

Hardy and Associates noted that most human perception of damage levels are made from an empirical standpoint: "The average person can feel vibrations that are from 1/100 to 1/1000 part of the magnitude necessary to damage structures. In addition, human response to vibrations is determined by sight and sound, such as window rattling, as well as feeling. It can be appreciated that such disturbances perceptible to hearing, sight and feeling, particularly if they are unexpected, exert a profound influence in a decision that the source is objectionable even though the magnitude of such disturbances is acceptable from the point of view of safety and discomfort." No recommendations regarding minimum distances from Vibroseis® units were made.

Conoco conducted an experiment in Kings County, California using two vibrator units with regard to possible damage to water wells near vibratory surveyances. This experiment demonstrated that the peak particle velocities measured by the instrumentation was roughly equivalent to freight trains operating on the Santa Fe railroad mainline 100 feet from the pickup sensor. Another correlation made in the experiment suggests that Vibroseis® operations are comparable to and no worse than excavating equipment. In terms of nuisance to humans, the experiment noted that a reasonable "threshold of feeling related to earth movements is about .023 inches per second but added that the threshold could vary from three times greater (.067 inches/second) to three times below (.007 inches/second). A "human variability factor" was defined as occurring at approximately .054 inches/second of movement. (All of the above values are at least 5 times lower than the 2.0 inches/second standard) The report pointed out "that the vibration level at which the average person thinks damage will result is considerably below the actual damaging level observed." As a result of the experiment, a minimal clearance from structures and irrigation facilities of 50 feet was recommended (P.L. Wilson, written communication, date unknown).

In another study initiated by Conoco, peak particle velocities were calculated for various sources of vibration in a city environment. Representative readings from the data are compared in Table 1. For purposes of assessing a nuisance factor, common vibrations were also measured. See Table 2.

The study concluded by suggesting that inhabitants of buildings approximately 20 to 40 feet from the vibrator have greater psychological disturbances from Vibroseis® vibrations than from other agitation sources normal to the city environment. (Albert Hrabetz, interoffice memorandum, "Comparative Vibration Levels from Various Sources of Agitation" July 31, 1958.) From the data presented in the three examples above, it appears that 100 feet separation between buildings or wells and a Vibroseis® survey team, would preclude damage to those structures and provide distance for an additional margin of safety.

Table 2 Comparison of Representative Readings from Two Vibratory Tests

Particle Velocity (inches per second)	Source	Distance in feet, source to sensor
2.0	Industry standard for minimum level of minor damage	
.6000	4-ton vibrator	25
.1130	4-ton vibrator	100
.0561	Door slam, wood floor	2
.0280	4-ton vibrator	150

Particle Velocity (inches per second)	Source	Distance in feet, source to sensor
2.0	Industry standard for minimum level of minor damage	
.6000	4-ton vibrator	25
.2300	4-ton vibrator	50
.1130	4-ton vibrator	100
.0280	4-ton vibrator	150
.000963	4-ton vibrator	800

Table 3 Common Vibrations

Particle Velocity (inches per second)	Source	Distance in feet, source to sensor
.0561	Door slam, wood floor	2
.0445	Door slam, wood floor	
.0199	Garbage disposal, grinding small bones	3
.0133	Attic fan	12
.004	Passenger car	20
.00261	Pickup truck	30
.0009	Washing machine - wash cycle	5

APPENDIX B

EXPLOSIVES

HANDLING

For a number of years, the traditional energy source for seismic prospecting was dynamite; it was the only source which provided enough energy for the recording equipment in use at that time. Dynamite and other high explosives produce a very fast build up in pressure when detonated and thus are an excellent seismic source. Detonation speed of high explosives may vary from 4,000 to 23,000 ft/second, depending upon strength and grade. An example of a high explosive formulated for seismic work is Geogel®.

Some drawbacks to the use of high explosives are immediately apparent:

- Shot holes must be drilled, which may be difficult and expensive in some areas. In rough terrain, truck-mounted drill rigs cannot be moved easily, while transporting water for drilling purposes in arid areas increases costs.
- Dynamite handling is dangerous. Nitroglycerin, the main constituent of dynamite, becomes unstable with age. Restrictions placed on dynamite use in some states has caused inconvenience and extra expense.

It is not surprising that as early as 1972, 46 percent of land shots in the United States were from nondynamite sources. (Dobrin, 1972).

Blasting agents are not explosives as such, but can be made to detonate by using a primer or blasting cap. Blasting agents are formulated from ammonium nitrate and do not require the stringent precautions required for high explosives.

The handling, transportation and use of explosives in Washington are governed by Chapter 70.74 RCW, Washington State Explosives Act; Chapter 296.52 WAC, Safety Standards for the Possession and Handling of Explosives; and applicable Department of Labor and Industries rules and regulations.

PREDICTING DAMAGES FROM SEISMIC DETONATION[1]

In the discussion in Appendix A, it was suggested that measurement of particle velocity was a useful parameter to predict damages from ground movement. Through research conducted by the E.I. duPont de Nemours Company and aquatic biologists, a relationship between weight of explosive charge and distance required to maintain a peak particle velocity at two inches per second, or less,

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1 Written communication from E.I. duPont de Nemours Co. to Ferrante Construction, Valdez, AK; August 10 1977.

was derived.[2] The following quantity-distance chart shows the weight of explosives which may be fired in a single blast without detrimental effects on aquatic life.

Distance (feet)	Maximum Charge Weight (pounds)*
20	2.4
40	9.6
60	21.5
80	38.4
100	60.0
120	86.4
160	153.6
200	240.0
240	345.6
280	470.4
320	619.4

* To prevent damages to nearby property and structures through excessive pressure rises, modern blasting technique has adapted the practice of spacing portions of blasts with small but significant delays measured in milliseconds. The pressure rise curve is more gentle as a result. The values of maximum charge weight shown are per delay, in this case eight milliseconds. Shot-hole seismic charges are not large enough to require use of the sequential technique.

In the derivation, a conservative value of two inches per second particle velocity was used to minimize impacts to anadromous fish embryos.

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[2] The relationship considers the following parameters:

a. Acoustic impedances and densities of water and rock,

b. Velocity of sound in water,

c. Compressional wave velocity in rock, and

d. Blast pressures in water and rock.

APPENDIX C

The following material was reprinted from the Forest Land Management Program Final Environmental Impact Statement published by the Washington State Department of Natural Resources in November, 1983. (Figures and tables are not included.)

EXISTING ENVIRONMENTAL CONDITIONS

PHYSICAL EFFECTS

EARTH

Geology

"Geology" is here defined to mean earth materials found on the earth's surface and the natural processes that have acted or now act on them. "Soil" is not included in this discussion. Geologic materials can have a wide range of composition, degree of formation and distribution within regional or local areas. Geology in any one locale results from the geologic history of that area, which could cover thousands to hundreds of millions of years of erosion, deposition, tectonic movement, glaciation or volcanic activity.

Rocks in northeastern Washington are over 500 million years old. The glacial deposits that overlie them in places are only 13,000 years old, and ash from Cascade volcanoes deposited over rocks and glacial debris may be only 2,000 to 6,000 years old. Modification of the state's geology is a continuing process as the earth's surface is eroded and the resulting sediments are deposited to form new geologic strata. A geologic timetable (Figure 26) has been provided for perspective.

It is convenient to divide Washington into seven physiographic provinces, shown on Figure 27: (1) the Olympic Peninsula Province, (2) the Willapa Hills Province, (3) the Glaciated Puget Sound Lowland Province, (4) the Cascade Mountain Range Province, (5) the Okanogan Highlands Province, (6) the Blue Mountains Province, and (7) the Columbia Basin Province.

Each province has its own unique combination of geological and other environmental characteristics. In many cases, boundaries between provinces are gradual transitions, with a mix of certain features at the boundaries.

The Olympic Peninsula Province includes the core of the Olympic Mountain Range, its foothills and the surrounding lowlands that were not covered by continental glaciation. The Willapa Hills Province includes the area generally bounded by

the Chehalis River to the north, the Columbia River to the south, the Cowlitz River to the east and the Pacific Ocean to the west. The Black Hills are also included in the Willapa Hills Province. The Glaciated Puget Sound Lowland Province consists of all those lowland areas surrounding Puget Sound where continental glaciation has played a primary role in influencing soil characteristics and behavior.

The Cascade Mountain Range Province is bounded on its northeast corner by the Methow River Valley, considered part of the adjoining Okanogan Highlands Province. Further south, the eastern boundary of the Cascade Mountain Range Province is the easternmost extension of managed timberland on the Cascade foothills. The Okanogan Highlands Province contains the part of Okanogan County from the Methow Valley east as well as all of Ferry, Stevens and Pend Oreille Counties and a small part of northern Spokane County. The Blue Mountains Province includes the Blue Mountains and the surrounding foothills. The Columbia Basin Province includes the generally nonforested areas of lower elevation in Eastern Washington outside the limits of the Cascade Mountain Range Province, the Okanogan Highlands Province and the Blue Mountains Province.

Because department-managed forest lands include relatively small blocks of land spread throughout the state, it is more practical to summarize the geology and geological conditions for each province than to try to describe department-managed lands. The following briefly summarizes the geology found in each province. For more detailed information, see "Geology of Washington," Reprint 12, published by the department's Division of Geology and Earth Resources (DNR, 1978), and the Geologic Map of Washington by Huntting et al., 1961.

The Olympic Peninsula Province

Two major bedrock terrains make up the Olympic Peninsula: peripheral rocks and core rocks. The oldest peripheral rocks are sandstone, argillite and conglomerate, which underlie and intermix with middle (and possibly lower) Eocene basaltic volcanic rocks (the Crescent Formation). The outcrop belt of the Crescent Formation forms a large horseshoe pattern open on the west. The Crescent is overlain by fossiliferous Eocene through Miocene sedimentary rocks of mostly marine origin. All peripheral rocks are folded and faulted, but they are, in general, in continuous layers. In contrast, the rocks in the core are highly deformed, although they also range from middle (and possible early) Eocene to middle Miocene.

The oldest rocks of the peninsula are exposed only at Point of the Arches on the coast. On sea cliffs and sea stacks, metamorphosed and altered Jurassic or older igneous rock is overlain by probable pre-Tertiary basalts and sedimentary rocks. The whole complex is covered by Eocene sedimentary rocks.

The youngest rocks of the peninsula are sedimentary rocks which formed in a marine environment, the Pliocene Quinault Formation and the Pliocene Quillaute Formation. They crop out only on the west of the peninsula.

Glacial debris from continental ice sheets surrounds the mountains on the northwest, north, east and southeast. Many mountain valleys and most of the

lowland on the west are flooded with gravels from Olympic alpine glaciers. Moraines of Olympic glaciers dot the higher slopes and valleys as well. Quaternary wave-cut terraces due to sea-level fluctuations during the Pleistocene occur along the western coastal margin of the province. Landslides, particularly debris flows, occur on the steep slopes throughout the Olympic Peninsula.

The Willapa Hills Province

Willapa Hills Province is made up of Tertiary marine sedimentary rock with layers of volcanics that increase in amounts of nonmarine strata as the Province moves east. Thick Quaternary sands and gravels that were deposited by streams flowing from glaciers overlay many areas. The Crescent Formation basalts core the higher hills in the south and west and northeast parts of the Willapa Hills Province. The Cowlitz Formation (interbedded marine and nonmarine siltstones and sandstones with occasional basalt flows) lies west of Chehalis/Centralia and along the northeast slopes of the basalt core of the Willapa Hills in the west and south-central area of the province.

The Lincoln Creek Formation -- a band of basaltic sandstones and tufaceous siltstones that crop out south of Aberdeen -- continues south and east of Pe Ell and Toledo. This formation borders the Cowlitz Formation on the east and north. It also crops out in the northeast corner of the province west of Oakville. In the southeast corner of the province, Columbia River basalt flows cap the sediments north and east of Longview. Surrounding much of the basalt core of the Willapa Hills are Miocene to Pliocene fluvial, lacustrine, brackish-water and shallow-marine sediments.

The early Pleistocene Logan Hill Formation was deposited by streams flowing from glaciers and forms some flat-topped surfaces on the very eastern edge of the province. This iron-stained, interbedded gravel, sand and silty clay is found at about 300 to 400 feet elevation. Stream terraces of Pleistocene age found along the valley sides of the Cowlitz River are silt and fine sand rising 60 to 80 feet above sea level. At the western margin, Quaternary terrace deposits cover the Tertiary bedrock, extending from Grays Harbor nearly to the Columbia River. Quaternary terraces from outwash of the continental glaciers are found along the Chehalis River, and Quaternary landslide deposits cover much of the landscape where the tufaceous Tertiary sediments have had massive slope failures.

The Glaciated Puget Sound Lowland Province

The Glaciated Puget Sound Lowland is a north-south depression filled with Pleistocene glacial and nonglacial sediments. Continental glaciers have occupied the Puget Lowland as many as four times. The surface of the Puget Lowland is covered predominantly by drift left by the latest glacier to occupy the Puget Lowland -- about 15,000 years ago. Soils have developed on till, outwash, sands and gravels and lacustrine silt and clay surficial deposits. The drift covers almost the entire lowland except in the northern and central areas, where relatively small amounts of bedrock are exposed. An extension of the Cascade Mountain Range occupies part of the northern Glaciated Puget Sound Province. The San Juan Islands and Chuckanut Mountains are Paleozoic to

Mesozoic crystalline, metamorphic and sedimentary rock that have been scoured by the continental glaciers, leaving exposed rock outcrops and areas of thin drift overlying bedrock. In the San Juan Islands, the Turtleback complex is a grouping of metamorphic, sedimentary and igneous rock types and younger sedimentary sandstones and shales. To the east, the Chuckanut Mountains consists of the continental, coal-bearing Chuckanut Formation to the north and a metamorphosed sedimentary rock type to the south, overlain in places by glacial deposits. In the central Puget Lowland, sedimentary rocks crop out in places where not covered by drift along another structural rise in a northwest trend from North Bend to Seattle. West of Bremerton, the basaltic Green and Gold Mountains rise to elevations of 1,000 to 1,700 feet and are covered by glacial deposits where erosion has not exposed the bedrock.

The most recent deposits found in the Glaciated Puget Sound Province are Holocene alluvium in the river and stream valleys, beach deposits along the shore of Puget Sound and landslide deposits (see Erosion) found predominantly at the base of the cliffs along Puget Sound.

The Cascade Mountain Range Province

The structure of Washington's Cascade Mountain Range is like an arch whose axis of folding is tilted or plunges to the south. Hence, like a plunging arch, the strongly uplifted and deeply eroded northern end of the range exposes the oldest rocks. These rocks are either recrystallized (metamorphic) from having once subsided into deep realms of high temperature and pressure, or are associated younger, once-molten igneous intrusive bodies (batholiths) which are themselves coarsely crystalline igneous and metamorphic rocks. They are relatively resistant to erosion and tend to persist as the steepest and tallest clusters (massifs) of peaks.

The larger intrusive bodies illustrate the different rates of erosion well, and include such units as: Mount Stuart, carved from granitic rocks of the Mount Stuart batholith; many alpine summits north of Snoqualmie Pass, eroded from the Snoqualmie batholith; the base of Mount Index and neighboring peaks, cut into the granitic rocks of the Index batholith; Sloan, Del Campo, Gothic and Kyes Peaks of the Monte Cristo Group, sculptured in granite; granitic peaks of the Illabot Range (Snow King Mountain and Mount Buckindy); the Dome Peak massif, chiseled from a granitic intrusive; the Chilliwack Group, sculptured from granitic rocks just south of the Canadian border, and the red granitic peaks of the Mount Silver Star area, carved from the Golden Horn batholith.

Crystalline metamorphic rocks notable for their resistance include banded types such as those of the Cascade Pass area (Mt. Goode, Mt. Buckner, Boston Peak, Forbidden Peak, Sahale Peak and Eldorado Peak are spectacular examples) and the rugged massifs of the Picket Range north of the Skagit River. These peaks are carved largely from one of the most strongly metamorphosed rock units, the Skagit gneiss.

Earlier deformation of the Cascades has produced a northwest-trending alignment of geologic structural features across the region. The latest major uplift established most of the altitude and the north-south trend of the range in

Pliocene time, but the northwest-trending structural alignment has been re-emphasized by certain features eroding more rapidly than others. Major valleys such as those of the Snoqualmie River, the Skykomish River, Lake Chelan, the upper Sauk River, the Suiattle River and the upper Yakima River have been eroded essentially parallel to the trends of adjacent structures. A notable down-faulted section preserves younger sedimentary rocks in a northwest-trending structure. Erosion by the Wenatchee drainage has carried away much of the younger, more easily eroded sedimentary rock, to reveal the older crystallines in steep faultline.

Sedimentary and volcanic rocks of late Cretaceous and Tertiary age have largely escaped the metamorphism that so thoroughly recrystallized the older rocks in earlier Mesazoic and Paleozoic time. Across most of the southern Cascades, where uplift was not strong enough to bring about deep erosion, the younger rocks still cover their ancient foundations.

Resistant ridge-forming sandstones interlayered with erodible siltstones and shales (called the Swauk Formation) swing in a horseshoe bend around the Mount Stuart massif, crossing Swauk Pass to form a belt northwest of the head of Cle Elum Lake. The Swauk Formation has been carved into foothills or relatively low mountains; again, the structural grain is clear in ridges and valleys eroded at different rates and times. The pattern of folds is perhaps not spectacular, but a great swarm of basaltic dikes*, the Teanaway dikes, adds diversity to the landscape.

Because of superior resistance to erosion, the dikes have come into relief, as can be seen along the highway across Swauk Pass, where they resemble dark walls rambling up and down hills of tawny Swauk Formation. The overlying Teanaway basalts have been largely removed by erosion, but in places they form steep rimrock cliffs above more gently contoured slopes of the Swauk Formation.

Throughout the southern Cascades the younger rocks are predominantly volcanics (solidified lavas and tephra, the airborne debris from volcanoes) of Tertiary age. Like the rocks to the north, their fold axes trend northwest and they are dislocated in places by faults. In spite of stream erosion, these volcanic rocks successfully cover most of the older rocks and structures upon which they were erupted. The harder units form steep cliffs and sharp ridges, particularly in the higher, glaciated portions of the range.

The rocks of the southern Cascades are also pierced locally by still younger intrusive bodies such as the Tatoosh pluton, the Carbon River stock and the Bumping Lake pluton. These are resistant granitic bodies exposed in the foundation and surroundings of Mount Rainier. Smaller intrusive plugs are of finer-grained volcanic rocks.

Younger Tertiary volcanic rocks include the Columbia River basalts of Miocene age, which spread not only across interior Washington but also over much of the ancestral southern Cascades, which had by this time been eroded to a low-lying

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*See Glossary

landscape. Proof of uplift in post-Miocene (i.e., Pliocene) time is graphically established by the obvious deformation of these originally horizontal lavas.

Columbia River basalts are essentially absent in the northern Cascades. A few small patches cap shoulders of sandstone, gneiss and granitic rocks above the river between Wenatchee and Entiat. Probably the north Cascades remained rugged enough in most places to remain above the lava floods; certainly they have been uplifted strongly enough to have shed any marginal basalt coverage they may once have acquired. The southern Cascades, on the other hand, received a larger cover of basalt in the first place, which they still largely retain because of their relatively modest uplift and incomplete erosion. In addition, lavas of Pleistocene and Recent age have followed canyons cut in the older rocks or been spread across the upland in places. These youngest flows are prominently in the far south near the latitude of Mt. St. Helens and Mt. Adams. They illustrate a continuing contest between upbuilding by volcanism and seemingly endless erosion in the southern Cascades.

As mentioned, Pleistocene glaciation and erosion have left scenic terrain throughout much of the Cascade Range; however, glacial drift is usually found only in the high-elevation cirque basins and larger valleys like the Skagit, Nooksack, Snoqualmie, Puyallup, Nisqually, Cowlitz and Lewis River valleys on the west side of the Cascades and the Chelan, Entiat, Wenatchee, Yakima and Naches River valleys on the eastside.

During the Quaternary period, development of picturesque volcanoes in the Cascade Mountains resulted in numerous deposits of tephra. Volcanic ash and ejecta from Mt. St. Helens, Mt. Adams and Mt. Rainier cover much of the terrain in the southern Cascades; in the northern Cascades ash and ejecta from Glacier Peak cover areas east into the Wenatchee, Entiat and Chelan Valleys. Erosion and mass wasting have added recent deposits of alluvium and landslide debris to the landscape.

The 1980 eruptions of Mt. St. Helens resulted in volcanic debris and mudflow deposits on some department-managed lands and tephra (volcanic debris, pumice, and ash) deposits on others. These deposits present a unique set of management problems, as described in earlier analyses.

The Okanogan Highlands Province

The Okanogan Highlands Province is a broad sweeping landscape in which summits and ridges curve smoothly down to glacially rounded valley floors. The geology is related to the Rocky Mountains to the east. Dominating the eastern Okanogan Highlands are rocks of well-layered marble, phyllite, quartzite, greenstones and gneiss, with scattered bodies of granite. The central and western highlands are predominantly granitics, with some metamorphics and volcanics east of the Okanogan River valley. The large block of department-managed forest lands west of Tonasket is predominantly granite and schist, with lesser areas of volcanic and metamorphic rocks. The Methow Valley has a thick, complicated sequence of sedimentary and volcanic rocks that crop out throughout the valley.

Probably the most important feature of the Okanogan Highlands Province is the scouring of bedrock and deposition of glacial sediments by continental ice

sheets. Most of the mountain tops and high ridges were smoothed down by the continental glaciers that overran this area. Till was plastered on the hill slopes where soil had been eroded. As the glaciers receded, many kame (ice margin) and outwash terraces were formed in many of the valleys. These terraces -- layered and unlayered silts, sands and gravels, cling to the hillsides at many elevations throughout the province. With recession of the glacier, stagnant ice dammed many rivers and streams forming lakes. The result is widely dispersed fine-grained lacustrine sediments on many hillslopes and valley bottoms.

During the Holocene epoch volcanic eruptions deposited ash from Glacier Peak, Mt. Baker, Mt. St. Helens and Mt. Mazama throughout the entire area. The ash, parent material and climate have formed unique soils in this province. Also during the Holocene, erosion played an important part in molding the landscape, particularly in areas of loose glacial deposits, where silt, sand, and gravel have been deposited and now make up the alluvial valley floors of the rivers and streams.

The Blue Mountains Province

Because of its marginal timber stands, the Blue Mountains Province is discussed very briefly. The predominant geologic feature of the Washington Blue Mountains is the heavily dissected Miocene basalt flows. These flows have been warped, and now river and stream erosion have cut deep canyons into the basalt. Because the climate is dry, little mass wasting (see Erosion) has occurred other than rockfalls along the steep canyon walls.

The Columbia Basin Province

The Columbia Basin Province is the nonforested area outside the Cascade Mountain Range Province to the west, the Okanogan Highlands Province to the north and the Blue Mountains Province to the south. The northeastern region of this province (near Spokane) is the only area likely to have any manageable timber. The entire province is underlain by a massive thickness of Miocene basalt flows, overlain in places by flood deposits of sand, silt and gravel from the great Pleistocene floods, or by loess, the probable wind-blown silt of Pleistocene age. In the northeastern part of the province, flood deposits cover most of the area, but outcrops of basalt occur along eroded flood channels. Flood deposits can consist of silts, sands or gravels in varying depths and stratification. In this area also are deposits of silt and clay lake sediments. Erosion has resulted in more recent deposits in the stream and river-valley bottoms. Volcanic ash from the Cascade volcanoes was the last material deposited over the area.

Soils

Soil is a fundamental and very important natural resource used in any forest management program. It is the basic medium for forest growth and rooting, and the storehouse of mineral nutrients and water required by the forest community.

"Soil" is defined as the earth material at or near the surface of the earth which supports or is capable of supporting plants. Its lower limit is the depth to which roots or the effects of other biological activity have penetrated.

Younger soils have many of the characteristics of the material from which they were formed. As time progresses, weathering alters the physical and chemical properties of the parent material, generally forming smaller soil particles and creating new chemical and mineralogical soil constituents. Water percolating downward through the soil can transport these soil constituents from one level and deposit them at a lower level. Thus, as a soil becomes more highly developed, a certain amount of layering is produced. These soil layers, called horizons, contrast with the soil materials above and below. The collection of soil horizons that makes up a soil is known as a soil profile.

At the surface of most undisturbed forest soil profiles is a layer of organic material known as duff. The duff layer consists of organic forest litter material, such as needles, twigs, cones and decomposition products. The duff layer grades into the mineral soil horizons below. This layer (the "O" horizon) contains 90 percent of the soil nutrients.

Mineral soil horizons can be divided into three categories. "A" horizons occur at or near the soil surface, and are the horizons into which surface organic matter first enters the mineral soil. "A" horizons are often the sites of the most intense biological and chemical activity in forest soils. "B" horizons occur at intermediate levels in soils, and often represent a zone of accumulated soil materials leached from the "A" horizon. At the lower limits of the soil profile are the "C" horizons, consisting of soil materials with relatively slight alterations of the parent materials due to surface weathering.

Among the most important soil-related properties affecting or affected by forest management activities are: (1) topography, (2) soil texture and rock-fragment content; (3) soil drainage characteristics; (4) the parent material from which the soil was derived; (5) soil depth and (6) amount, character and distribution of soil organic matter.

Topography -- gradient of slope, slope shape and position on slope -- significantly influences the character and behavior of soils. As a rule, soils formed on steeper slopes tend to be shallower and less developed than soils of the same area on more gentle topography. This is because, as slopes increase, the potential for soil removal by erosion and mass wasting increases (see Erosion). The slope gradient and its shape have a significant effect on water movement, both on the surface and internal. Concave surfaces tend to collect and retain more moisture than otherwise similar convex surfaces.

Position on slope can influence major soil properties. Soils generally become deeper and finer-textured as one moves down from ridgecrests to the toeslopes below. Three slope classes will be used to describe the gradient of topographic slope; moderate slopes are those less than 30 percent, steep slopes are those between 30 and 65 percent, and precipitous slopes are those greater than 65 percent.

Textural class of a soil is determined by relative proportions of clay, silt and sand. Percentages of gravel and other rock fragments are considered textural modifiers. Textural class of a soil has much to do with influencing moisture movements through and into it. Moisture movement through and into soils tends to be favored by coarse textures and restricted by fine textures. Erosion potential for a soil is influenced significantly by its texture (see Erosion).

The potential for a soil to absorb and hold nutrients and other chemical agents, natural and artificial, is increased as finer soil fractions, primarily clay, increase. Soil textures for particles less than two millimeters in diameter will be subdivided into three categories based on percentages of sand, silt and clay. Coarse-textured soils will include those with sand, loamy sand or sandy loam textures. Medium-textured soils will include those with loam, sandy clay loam, sandy clay or clay-loam textures. And fine-textured soils will include those with silt loam, silty clay loam, silty clay, silt or clay textures.

Soil drainage measures the rate at which moisture moves into and through the soil. Soils with adequate drainage can absorb and transport internally enough water to avoid problems caused by surface flow or saturation. Several factors influence soil drainage, including soil texture, soil structure, organic matter content, topography and depth of soil horizons restricting water movement.

Soil structure, the degree and type of aggregation of individual particles into larger units, affects porosity and thus soil drainage. Since organic matter serves as a major binding agent in forming soil structure and increasing soil porosity, it is also important in determining soil drainage. Changes in soil structure and soil organic matter content by certain forest management activities can alter a soils drainage behavior.

Variations in soil parent material can produce significant differences in soil properties and behavior in areas of uniform climate, vegetation, topography, etc. Certain parent materials increase the potential for erosion, mass wasting and other problems in the soils formed from them. As an example, sideslopes on soils from sedimentary rock types have been found generally less stable than those from igneous rock types in the same area. Knowing the parent material distribution in an area can thus indicate potential soil problem areas.

Soil depth greatly determines a soil's capacity to absorb and hold water, nutrients, etc. Shallow soils become water-saturated faster during precipitation, and saturated soils tend to be more subject to surface flow erosion and mass wasting. Shallow soils are those that average less than 20 inches deep to bedrock or other impermeable layer; moderately deep soils average from 20 to 40 inches in depth; and deep soils average 40 inches or more in depth.

Organic matter significantly affects soil character and behavior. It serves as a primary binding agent in creating and maintaining soil structure. Soil structure has a major effect on maintaining good soil porosity. Soils with much incorporated organic matter tend to have greater structural development, are more porous and are thus more resistant to surface flow and its erosion. The binding action of incorporated soil organic matter also reduces erosion by holding particles in place and limiting detachability.

A soil is the product of interaction of: (1) climate, (2) organisms, (3) parent material, (4) topography and (5) time. A variation in any one can produce significant differences in soil properties and behavior. The wide range of climate, vegetation, geological materials, topography and soil ages across the forest lands of Washington produces an extremely varied collection of soil types. The physiographic provinces described earlier will be used here to aid the discussion of soil conditions.

The Olympic Peninsula Province

The Olympic Peninsula Province is characterized by high mean annual precipitation and soils with generally shallow to moderate depths. Mean annual precipitation ranges from approximately 80 inches along the western coastal areas to over 200 inches at the central core of the Olympic Range. The shallow to moderate soil depths have been greatly influenced by a combination of glacial activity centered in the Olympic Range, the character of the geologic parent material and recent geomorphologic processes.

The central core of the Olympic Range was the source of several glacial events during the Pleistocene period. Glaciers extended out beyond the mountain front, scouring and depositing as they went. Within the mountain range, U-shaped valleys with steep to precipitous sideslopes are a typical result of this glaciation. Rapid stream downcutting has also contributed to oversteepening of slopes in certain areas. The steep to precipitous sideslopes, high precipitation rates and somewhat unstable character of the primarily sedimentary bedrock within the range interior have contributed to a relatively high natural slope instability. This has resulted in mostly shallow soils on the sideslopes. Along the larger stream bottoms and beyond the mountain front, alluvial and glacially derived deposits generally support soils of greater depth.

Textural properties of Peninsula soils span the full range. Soil textures within the mountain front tend to be generally coarser, due to the relative youth of the soil surfaces. Gravel contents tend to be relatively high, particularly on steep to precipitous sideslopes. Beyond the mountain front, textures become generally moderate to fine, due to the somewhat finer character of the geologic parent material and the greater age of most of the soil surfaces.

Organic matter content and distribution within the soils of the Peninsula is primarily a function of elevation. At lower elevations the organic matter in the duff layer is more rapidly converted into humus and incorporated into the mineral soil than at higher elevations. There, where temperatures are colder, soil biological activity tends to be significantly reduced. Thus, at higher elevations forested soils tend to have thicker duff layers and lower humus production and incorporation. Lower humus incorporation limits soils' structural development and forest productivity.

Forest productivity is lower at higher elevations in the Olympic Peninsula Province because of shallow soils, lower humus production and incorporation, and shorter, cooler growing seasons. As one moves out through the Olympic foothills to the coastal areas, forest productivity becomes significantly greater because of improved soil, higher temperatures and a longer growing season.

The Willapa Hills Province

The Willapa Hills Province has much less topographic relief than the Olympic Peninsula Province to the north. The Province was not subjected to scouring by glaciation during the Pleistocene period; its absence has produced a region largely covered by relatively mature surfaces and soils. The long time during

which soil-forming processes have been active, and their intensity due to the high mean annual precipitation (generally from 70 to 120 inches) and moderate temperatures, have produced an area characterized by deep, medium-to-fine textured soils.

Drainage characteristics of most soils in this province are favored by their depth, good structural development and relatively high organic matter. In undisturbed situations, most soils of the Willapa Hills Province can absorb and transport all water supplied during peak precipitation with minimum surface flow or other negative effects. The poorly drained soils in the Province generally occur in depressions or on level surfaces with drainage-restricting soil horizons.

Although surface flow is minimal and general drainage characteristics favorable on most undisturbed soils in the Province, mass wasting is a problem in certain areas. Deeply weathered sedimentary materials, particularly those with strata that concentrate subsurface water and those on steep to precipitous sideslopes, tend to favor mass wasting. Soil surfaces formed on basalts in the Province, as well as other parts of the state, tend to be relatively free of most mass wasting processes.

Organic matter contents in most soils of the Province are high in comparison to other Washington areas. High precipitation and moderate temperatures favor production of large amounts of forest litter (needles, twigs, cones, etc.), which is rapidly converted into humus and incorporated into the soil. Rapid conversion of litter into humus favors these soils' structural development and nutrient status. The "A" horizons are generally thicker than those in other parts of the state.

Soils of the Province are among the most productive in the state. The greater depths, finer textures, better structural development, higher humus contents and better drainage of these soils compared to those of other provinces contribute to this greater productivity.

The Glaciated Puget Sound Lowland Province

Soils of the Glaciated Puget Sound Lowland Province are in a region of relatively subdued topography with moderate mean annual precipitation levels generally between 30 and 70 inches. Soils of this region vary widely because of the variety of glacial and more-recent parent materials deposited here. Due to the relative youth of most soils in the region (less than 13,000 years for most) characteristics of the parent materials have been little altered by soil-forming processes. Thus, parent material is of primary importance in determining these soils' characteristics and behavior. Three major types of glacial deposits support forested soils in this province: glacial till, glacial outwash and glacial lacustrine.

Till is deposited directly by glacial ice, and thus lacks the particle-size sorting characteristic of water-deposited parent materials. Till soils can contain a wide range of particle sizes, from large stones to clay, within the same profile. The till-derived soils of the Glaciated Puget Sound Lowland Province generally have an extremely resistant layer of compacted till material

at a depth of from 20 to 40 inches, which limits penetration of both roots and water.

In certain areas shallow layers of till have been deposited directly on the underlying bedrock. These soils behave much as other till soils of the region, in that the bedrock also restricts penetration of roots and water. Till soils present forest management problems in certain situations. As the depth to the impermeable layer becomes shallower, soil saturation is more likely to cause mass wasting and surface flow, particularly on steep sideslopes. In low-lying depressions the impenetrable layer can limit drainage and thus increase the chances of surface saturation, particularly during the rainy season.

Glacial-outwash deposits are primarily sand and gravel-sized particles much more sorted and stratified than till deposits. Because of their generally moderate slopes, coarser textures and lack of restrictive layers, outwash soils tend to have the lowest potential for mass wasting and erosion of any of the glacially-derived soils.

Soils from glacial lacustrine deposits are the finest textured in the region. The textures are dominated by silts and clays deposited in glacial lakes. These lacustrine deposits often display layering, with bands of contrasting texture. Their fine textures and the banding, which tends to concentrate subsurface water to saturation levels, greatly limit the drainage. Soils formed on lacustrine deposits present a great potential for erosion and mass wasting particularly on steep and precipitous slopes. The soils' generally restricted drainage can cause accumulations of surface water in low-lying depressions, particularly during the rainy season.

Humus production and incorporation occur at average rates throughout the Glaciated Puget Sound Lowland Province because of the moderate climate. Production and incorporation are hampered in certain soils by limited water-holding capacity or excessive moisture. Thin "A" horizons are typical in the province. Forest productivity of these soils is generally average for Western Washington. The highest productivity in this region is generally found on deep, well-drained soils of medium texture. Coarse-textured outwash soils with a lot of gravel, and poorly drained fine-textured lacustrine soils, are of below-average productivity.

The Cascade Mountain Range Province

The Cascade Mountain Range Province is perhaps the most diverse. Variations in elevation, precipitation, parent material, topography and vegetation contribute to a wide range of soils in this province.

Soil depths generally vary with elevation and slope. Soils at higher elevations and those on precipitous slopes tend to be shallow, while deep and moderately deep soils occur commonly on moderate slopes and at lower elevations. In many areas of the province, especially in the northern sections, glaciation and natural erosion and mass wasting have left large areas of exposed bedrock and shallow soils. These soils, as in other parts of the state, have a higher potential for mass wasting and erosion, particularly on steep slopes. In the southern parts of the province are large areas of deep and moderately deep soils

formed on a variety of parent materials, including volcanic-ash deposits and deeply weathered bedrock.

Because of the predominant coarse and moderate soil textures in the Cascade Mountain Range Province, its major drainage is caused by topography and depth to an impenetrable layer. Soil drainage in this as in other provinces often presents problems in areas of concave slope shape, where surface and subsurface waters accumulate. Shallow soils exaggerate the hazards of surface flow and mass wasting.

Organic matter character and distribution in forest soils of the Province follow the pattern common to other forested mountain regions. Organic matter is converted to humus and incorporated into the soil more slowly under the low temperatures of the higher-elevation forests. Duff layers generally get thicker and humus production is reduced as one moves higher in these forested areas.

The rain-shadow effect of the Cascades has created a drier forested environment on their eastern slopes, complete with a different set of forested communities and soil-forming processes. The drier forests of Eastern Washington generally contain less organic litter and less moisture for leaching and other soil-forming processes. Compared to soils on the western Cascade slopes at similar elevations in similar parent material, soils on the eastern slopes are generally less weathered and less acid, and have less organic matter.

Forest productivity varies widely. Areas of deep, medium-textured soils and favorable climate in the southwest corner of the Province provide above-average conditions for forest growth. Forest productivity is limited by shallow coarse-textured soils occurring throughout the province, the short growing season of the high elevations and the low precipitation of the eastern forested flanks of the Cascades.

Deposits from the 1980 eruptions of Mt. St. Helens present a new set of soil characteristics on some department-managed lands. Lack of soil development on these deposits and their high erodibility produce serious forest management problems. Forest productivity cannot be accurately determined, but it is generally accepted that current forest productivity levels are below those before the eruption, particularly on mudflow deposits and deeper volcanic ash and pumice deposits. The high mass wasting and surface erosion on these deposits may require special forest management plans.

The Okanogan Highlands Province

The Okanogan Highlands Province, like the Cascades to the west, contains a wide range of environments and soils. Located in the rain shadow of the Cascades, its mean annual precipitation averages approximately 15 inches at the lower elevations along the western and southern boundaries and rises to above 50 inches in the mountainous areas of Pend Oreille County. Elevation within this province has a great effect on mean annual precipitation, forest communities and soils. As elevation increases within the province, mean annual precipitation increases, stocking densities of the forest communities generally increase and more moisture is available for soil-forming processes.

The province has been extensively glaciated. Glacial outwash and till deposits are the predominant soil parent materials; glacial lacustrine deposits are also common in some areas. Wind-deposited soil materials, predominantly silt, and volcanic-ash deposits blanket much of the province and overlie these glacial deposits. Because of the resistant character of bedrock materials and the rugged topography in certain areas, a significant proportion of the area was left with shallow soils and bedrock after the glaciers retreated.

Because of relatively slow soil formation and relative youth of these soils, their textures have been little altered since the parent materials were deposited. Coarse- and medium-textured soils are typical, and gravel contents, particularly in outwash and till soils, are generally high.

Soil drainage is not generally a problem in the province during the dry season, except on shallow soils or in depressions. During the spring snowmelt, however, particularly when surface soil horizons are frozen, the water added is more than many soils can absorb. This can cause surface flow, ponding and associated problems. This situation can occur throughout the other forested regions of Eastern Washington as well.

As in the other forested regions of Eastern Washington, soil organic matter is relatively low in the Okanogan Highlands Province, reflecting the low mean annual precipitation of much of the area. Organic matter increases as elevation and mean annual precipitation increase. It reaches a maximum in the northeast corner of the province, where forest and precipitation conditions are similar to those in Western Washington.

Throughout Eastern Washington there are often contrasts between the vegetation and soils of north- and south-facing slopes. Because of protection from more vegetation, thicker duff layers and the binding effects of more soil organic matter, soils on north-facing slopes tend to be more stable than nearby soils on south-facing slopes.

The Blue Mountains Province

The Blue Mountains Province has climatic characteristics similar to those of the Okanogan Highlands Province, but with slightly lower maximum mean annual precipitation at higher elevations. The province is underlain primarily by basalts. Glacial deposits of basaltic material are found at the higher elevations, while wind-deposited parent materials (loess) become common at the lower elevations. Evidence of volcanic ashfall materials is common in many soils of the province.

Despite differences in parent materials, soil-forming processes and forest soil management problems in the Blue Mountains Province are similar to those in other parts of Eastern Washington.

Forest productivity is relatively low throughout the province, and tends to be limited by low precipitation at lower elevations and low temperatures at high elevations. Soil characteristics generally do not limit forest productivity.

The Columbia Basin Province

The Columbia Basin Province is the generally nonforested lower-elevation area of Eastern Washington not included within the other provinces. Its soils range from deep, fertile silt-loam soils formed on loess in the southeastern corner of the province to the very gravelly glacial outwash soils in the central part of the province. The few forests in this province are generally at its edges in areas of slightly higher mean annual precipitation or where topography creates northern aspects and soil-moisture conditions favor tree survival. Soil characteristics have less influence on forest productivity in this province than mean annual precipitation and topographic position. Drainage, water erosion, and mass wasting are generally not considered problems in the forested areas of the Province because of the generally coarse-textured, stable soils on the typical subdued topography. The limited forest management in this province has small negative impact on soils because of their stable character and the low mean annual precipitation.

Topography

Same as Geology.

Unique Physical Features

Washington is an area of great topographic diversity; some of this diversity appears on the widely scattered department-managed forest lands. Difficulties in attempting to catalog these features (for example, the "Environmental Reconnaissance Inventory" of the U.S. Army Corps of Engineers in 1973) are compounded by the checkerboard location of that forest land.

An illustration of this problem (relatively small tracts and large features) is provided by the so-called "Channeled Scablands" of Eastern Washington. Here, catastrophic late Pleistocene floods left extensive channel systems and related features. An isolated tract of state timber land might exhibit only one side of a single meltwater channel. The segment of rock wall that forms the channel edge would probably be unrecognizable as such from the ground, would have miles of counterparts elsewhere and would not in itself (out of context) appear unique.

Another difficulty in inventorying unique features has to do with defining "unique." Using the common definition of "being without like or equal," it is easy to see that, given enough scrutiny, all physical features are unique. One waterfall or volcanic cinder cone may look pretty much like another to the untrained eye, but the expert can often point out important characteristics that make it unique.

Problems of scale, setting, perspective and observer training and background aside, the approach to unique physical features used here is to identify the kinds of features one can expect in various parts of the state, and thus

possibly on department-managed timber lands. An acquaintance with the geology and geologic history of the physiographic provinces can assist in understanding the distribution, history and significance of such features.

Erosion

"Erosion" is defined as the process of detachment and transportation of soil materials by water, gravity, glacial ice and wind. On most forested lands the effects of glacial ice and wind erosion are negligible. In some areas of Eastern Washington wind is erosive because of the sparse vegetation under the trees. Erosive forces acting on forested areas are moving water (water erosion) and gravity (mass movements).

Water erosion requires three conditions: (1) surface flow, (2) detachability and (3) transport. Surface flow occurs when the water reaching a soil surface exceeds soil infiltration rate. Surface flow is most common during high intensity rainfall. Several factors influence infiltration rate. The role of coarse textures, good soil structural development, low bulk densities and undisturbed duff layers in favoring rapid infiltration was discussed in Soils.

When soils are saturated from long rainfall or when the amount of rainfall exceeds infiltration rates, nearly all the precipitation may become surface runoff. Because of the many irregularities of the ground surface, overland flow in mountainous areas is quickly concentrated into tiny streams (rills) where its erosive power is greatly increased. Large changes in velocity of flow are caused by slope differences. Flow velocities affected by slope alone vary as its square root. For example, an increase of four times slope will double the velocity of a given flow volume.

The detachment ability of surface flow varies as the square of the velocity (Longwell, Knopf and Flint, 1939). Small abrasive particles in surface flow greatly increase its power to detach other particles.

Soil removed from rills and gullies is usually determined by flowing surface water, but splashing raindrops usually detach most of that which is eroded from smooth surfaces (Ellison, 1947). Undisturbed duff limits soil detachability by reducing raindrop impact and favoring infiltration.

Several soil properties influence its potential for detachability. Middleton (1930) found texture a general indicator of erodibility. He found that where ratio of clay to silt in a soil is very low, too little clay is present to bind the material into aggregates, and silt particles are free to be suspended in the runoff water. Musgrave (1947) studied soils from 19 localities and found that silt loams were most erodible, sandy soils least. Olson and Wischmeier (1963) concluded that coarse sandy soils were least erodible, soils whose characteristics were dominated by clay were moderately erodible and soils of intermediate texture were most erodible.

APPENDIX D

DRILLING MUD MATERIALS

Drilling mud materials identified as toxic or hazardous are to be handled, stored and transported per Chapter 173-303 WAC. [W4, WI8]

FUNCTION	MATERIALS	WHY USED
Lubricants	Certain oils, graphite powder and soaps	To reduce downhole friction
Flocculants	Salt, hydrated lime, gypsum and sodium tetraphosphates	To increase gel strength. Causes some solids to settle out
Filtrate Reducers	Bentonite clays, sodium carboxy-methyl cellulose (CMC) and pregelatinized starch	Reduce filter loss. Prevent "water loss" to porous formations
Foaming Agents	Anionic foaming chemicals	Causes formation water to foam helping gas or air drilling to continue
Restore Circulation	Asphalt emulsions, asbestos fibers, shredded plastics mica flakes, nut hulls, cedar fibers, cottonseed hulls and many other materials	To stop mud loss to porous zones
Shale Control Inhibitors	Gypsum, sodium silicate, chrome lignosulfates, lime and salt	To stop or prevent swelling of shales or clays
Surface Active Agents	Surfactant chemicals	To permit better mixing. Example: water and oil
Thinners and Dispersants	Quebracho, some polyphosphates and lignitic materials	To prevent too high a viscosity, improve pumpability, provide better solids distribution in muds

FUNCTION	MATERIALS	WHY USED
Viscosifiers	Bentonite, CMC, attapaulgite clays and asbestos fibers	To increase viscosity for cuttings removal and gel strength
Preservatives	Formaldehyde	Prevent starch mud from fermenting
Cement Decontamination	Sodium bicarbonate	Prevents mud destruction
Calcium Removers	Caustic soda, soda ash, certain polyphosphates (SAPP) and sodium bicarbonate	To prevent mud destruction by gypsum or anhydrite
Weight Materials	Barite, lead compounds, iron oxides and high specific gravity compounds	To increase mud weight (pounds per gallon) to hold formation fluids in place and prevent hole caving
Corrosion Inhibitors	Hydrated lime, amine salts and dichromate salts	To prevent corrosion of drilling equipment and casing
Oil Emulsion	Special emulsifiers or soaps	To make oil-in-water or water-in-oil emulsions for "oil base" mud

Sources:

American Association of Oilwell Drilling Contractors. Toolpusher's Manual. Section O. September 1970.

Gatlin, Carl. "Drilling and Well Completions." In Petroleum Engineering. Chapter 6. Prentice-Hall, Inc. New York. 1960.

APPENDIX E

STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES
BRIAN J. BOYLE, Commissioner of Public Lands

OIL AND GAS LEASE INSPECTION REPORT

Date 4-13-84

Applicant's Name SEATTLE DE BOLT ASSOCIATES Application No. 85585

The following items pertain to the area to be leased:

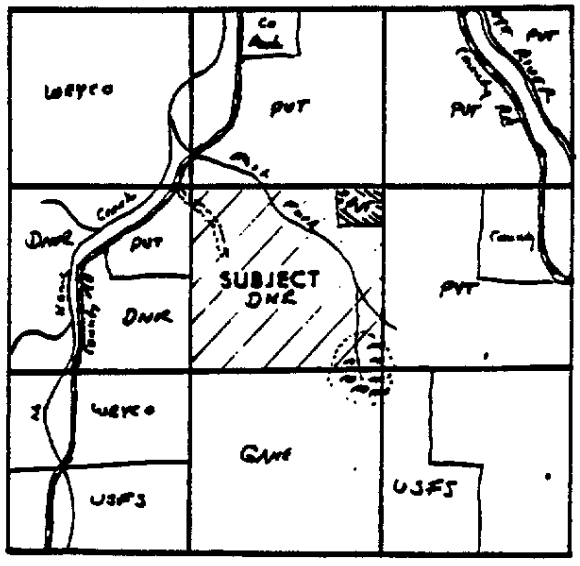
1. Surface Ownership: State [X] Deeded [ ] Both [X]
   NE¼ NE¼ TIMBER RIGHTS DEEDED TO [illegible] DAM
   (Name of surface owner if other than state)
2. Current Use Forestry
3. Ground Cover Second growth timber
4. Topography Gentle to moderate
5. Access: State [X] Private [ ] Other [ ]
   COUNTY and DNR ROADS
   (Explain)
6. Zoning FORESTRY AND AGRICULTURE
   (Obtain from current County Comprehensive Plan)
   COUNTY REQUIRES ROAD PERMIT FOR HEAVY EQUIPMENT
7. Archeological/[illegible]? [illegible]angered plants/animals? Yes [X] No [ ]
8. Other Information TYPE 2,3,4,5 [illegible] in area
   TYPE 4,5 WATERS on DNR land
   93-001787 PLANT [illegible] 002286 SPECIAL ANIMAL
   OF=COTTONWOOD RESOURCE AREA

Sec. 16 Township 18 [illegible] 3E, W.M. THURSTON County

Scale: [illegible]" = 4,000 feet

On the plat, indicate the location of the following on the property and within one mile radius of property:

1. Surface ownership, if ownership other than state.
2. Adjacent surface ownership.
3. Incorporated areas.
4. Municipal watersheds.
5. Natural Area Preserves, endangered species, plant and animals.
6. Rivers, lakes, wetlands and other natural features.
7. Residences and other buildings.
8. Ground cover.
9. Game Department Lands.
10. State parks and other parks.
11. Any other significant features.



DNR - FEE SIMPLE
DNR - OIL AND MINERAL RIGHTS ONLY
WETLANDS - [illegible]

RES 30-1820 (12-82)

((PROGRAM)) POLICY IMPACT ANALYSIS INDEX

POLICIES WITH IMPACTS ON THE ENVIRONMENT	ELEMENTS OF THE ENVIRONMENT								
	Earth	Air	Water	Plants & Animals	Energy & Nat. Res.	Env. Health	Land Use	Transp.	Pub. Serv. & Utilities
Plants & Animals	39	39	39	39	40	40	40	40	40
Nat. Areas & Registry	40	40	40	40	41	41	41	41	41
Cultural Resources	41	41	41	41	41	42	42	42	42
Road Construction	43	43	43	44	44	44	44	45	45
Gravity Surveys	51	51	51	51	51	51	51	51	51
Magnetotelluric	52	52	52	52		54	54	54	54
Time-Domain Sound.	54	54	54	54	54	54	54	54	54
Geochemical Sampling	55	55	55	55	55	55	55	55	55
Vibratory Surveys	58	58	58	58	60	60	60	60	60
Shot Hole Seismic	62	63	63	63	64	64	65	65	65
Air Shot Seismic	66	66	67	67	67	67	68	68	68
Stratigraphic Drill.	70	70	70	72	72	72	72	73	73
Drill Pad Construction & Rig Ass'y.	75	75	76	76	76	76	78	78	79
Exploratory Drilling	79	79	80	81	81	82	83	84	84

APPENDIX F

PUBLIC COMMENTS ON DRAFT OIL AND GAS LEASE PROGRAM AND DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

APPENDIX F

PUBLIC COMMENTS ON DRAFT OIL AND GAS LEASE PROGRAM AND DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Introduction

This appendix includes all comments received on the draft Oil and Gas Lease Program (Program) and the draft Programmatic Environmental Impact Statement (PEIS) written on the Program. The first section deals with oral comments received at public meetings held January 7, 8, 9, 1985. The second section includes written comments received by the department. Nineteen comment letters were received and the departmental responses to them are noted in this section.

Notations made next to comments refer the reader to the appropriate page(s) in the Final Oil and Gas Lease Program or Final Environmental Impact Statement (FEIS). In the notations, there are letters followed by one or a series of numbers. The letter "P" designates the Program and the letter "E" designates the FEIS. The number following the letter is the page number in the respective document. For example, P42 refers to page 42 of the Program; Eiii refers to page iii of the FEIS. Where changes were adopted in the draft Program or draft PEIS they are underlined; i.e., P44, E47. The word "NOTED" appears when the particular subject is not specifically addressed in either of the documents. In these cases it is the department's judgment, after considering the comment, that changes to the documents are not warranted. It is important to note that some issues raised in the comments are answered by multiple page listings. If multiple pages are listed, the reader should assemble the information from all listed pages for a clearer understanding of the department's response to the issue.

Each testimony and written comment have been given reference codes for identification; H for hearing and W for written. The appropriate reference has been placed in either the Program or FEIS to show which section has been designated to answer the question raised in the testimony or written comments.

All comments were appreciated by the department and were carefully considered, even where changes have not been made to the documents.

TABLE OF CONTENTS

PUBLIC HEARINGS

Public hearings on the department's draft Oil & Gas Lease Program and the draft Programmatic EIS were held at the following locations and dates indicated.

Moses Lake	January 7, 1985
Wenatchee	" "
Yakima	" "
Everett	January 8, 1985
Issaquah	" "
Olympia	January 9, 1985

Public Comments

8 people attended the hearings; formal testimony was given by 5. The transcriptions are reproduced in their entirety.

Dan Mathias, Public Works Deptment
Everett, WA, January 8, 1985 (Reference Code H1)

P42,46 I'm representing the Public Works Dept. in regards to managing our Sultan Basin Watershed, which is used to supply water to about 80% of the population in Snohomish County. We've previously sent 3 letters to DNR stating our position. I wanted to reiterate our position today. We are opposed to any oil and gas activity in the Basin that would result in any surface disturbance or the potential for the spill of oils or other chemicals that would be on-site during an operation. For example, chemical additives are mentioned in the EIS that may be needed. I realize that the City of Everett's municipal watershed will be defined as category 2, which means that there will be no surface disturbances; the only method allowed will be slant drilling. I want to point out that's why I think the EIS is a very general document that is only stating policy; there's no specific information to our Basin or any other basin. I wanted to point out that if you use slant drilling in the Basin, you also have an adjacent watershed, the Pilchuck, which supplies water to Snohomish River. We don't understand how you're going to have no surface disturbance in one watershed or another when they are, in fact, adjacent to each other.

P39,50 52 Another concern we have is that, while some of these oil and gas lease offerings appear to be out of the watershed, they also appear to be accessible through roads that pass through the watershed. In fact, some of them are owned by the City of Everett. Any activity like that will require a road use permit from the City of Everett. Also, we'll be concerned about movement and transportation of any material through the Basin and what the likelihood is of any spills of oil or any chemicals, and if there needs to be any oil pipeline constructed to transport oil from the site into a better market area. We wanted to reiterate what we had previously stated in three letters.

This is a question that would be better left until later, but I wanted to know about the operations plan mentioned in the EIS. If the operations plan is going to be available for review for the general public, we may be able to provide some input. Maybe we can work together to alleviate some of our concerns. Thank you.

Darrell Williams, Environmental Technician for the Tulalip Tribes
Everett, WA, January 8, 1985 (Reference Code H2)

P47,49 I don't have a prepared speech, but will probably send in a letter of comments later. I will be interested in possible impacts to fisheries within the Snohomish and Stilliguamish River Basins, and also the protection of cultural and religious sites that may be on DNR lands. In the draft EIS it's stated that DNR would be checking with office of Archeological and Historic Sites, but would also request that you contact the neighboring Indian tribes to see if there are any cultural and religious sites pertaining to the tribes in the area of the oil and gas leases. Thank you.

Dave Clark, King County Planning Division
Issaquah, WA, January 8, 1985 (Reference Code H3)

I have a few general comments about the EIS, and I'd like to ask a couple of questions at the conclusion. In a fairly cursory review, I think the county would generally support alternative two as the preferred means of identifying lands available for lease.

Can there be directional drilling from outside buffer area?

DNR: Yes.

King County supports buffer area 200' in and around wetlands.

Pvii, 42,43 In King County we've gone out and field-reviewed over 900 individual wetlands in the county, about 76% of which don't fall under the jurisdiction of the Shoreline Management Act. They are not associated with waters of the state and therefore not protected by proposed buffers that are identified here, and our wetland definition is not the same as yours. I would think that we would prefer some modifying clauses in the ultimately adopted program....recognizing more detailed program where one does exist for a sensitive area such as wetlands that could be recognized by the state's leasing program. It may well be that some of these wetlands, that aren't in fact associated with shorelines in the state, are considerably more important than those that are associated with shorelines in the state. We have in the county's wetland program identified each wetland in terms of its hydrologic cultural water carrying capacity and some other factors and rated each one of the over 900 as unique and outstanding, or of moderate significance. So we have acquired some judgments as to which of those are more important, and we'd like to see certainly those that are rated #1, unique and outstanding, some way be reflected in the state's....leasing, at least in this county.

NOTED Under plants and animals, on p. 20 (of the PEIS) under Resource Protection. Third paragraph at top of page. Statement alludes to the fact that it's possible that no oil and gas activity could take place until an intensive on-site survey was done. Land use restrictions imposed by this option may not be warranted, since only one endangered and seven threatened plant species and two endangered animal species on the WA State list are found on department-managed land as of October 1984. As one twists to the logic, I would submit that since there are so very few threatened or endangered species on state-managed land then the state has as valid an obligation to look toward regulatory practices that would, in fact, protect those, since they certainly aren't affecting very much of the state-managed land. Reverse logic is as logical, since there aren't many, probably no need to impose restrictions as purported in the EIS. On the other hand, since there aren't very many, I would submit that you could aggressively protect those since there would not be very much state land impacted. That's the main comment I have.

E71,81 Another issue that's come up lately and I haven't found the specific chapter or paragraph that deals with it is impacts of drilling, even exploratory drilling, on ground waters. We have, in King County and in Pierce County, become more concerned about ground water contamination and particularly ground waters that are presently being used for L&I purposes for industrial drinking water supplies. I think to the extent that sensitive aquifers have already been identified by major water purveyors and counties, there'd be some real concern on the counties' part, of leased land being made available for drilling that could potentially hydrologic relate to 2, 3, 4 different levels of different aquifers. We've found in this county that some of the shallow-level aquifers tend to be the most polluted in that surface waters and other contaminants can easily reach those shallow aquifer levels. The deeper wells seem to be in fairly good shape, but in punching holes in the ground there's the potential for co-mingling of degraded water with water at deeper levels that is not apparently degraded, even if the holes are punched on state-owned land. Once the underground aquifers are linked there's a potential for cross migration, and we would be very concerned that exploration and drilling would occur in fairly close proximity to aquifers that are in use by large or even rural populations for drinking water. I'm not sure how the programmatic EIS deals with that. I guess I'm expressing a concern that it should if it doesn't already. Thank you.

Marshall T. Huntting, Consulting Geologist
Silver Creek, WA, January 9, 1985 (Reference Code H4)

NOTED A fact that is not generally recognized and that is appropriate to every resource management agency, or an agency involved with resource management, is that all the world's wealth comes from its natural resources - mining, agriculture, forestry, and fishing - through application of labor and techology.

I regret seeing people rejoice in the demise of basic industry and the emergence of the service industries. Service industries don't contribute to the wealth of a nation; they merely redistribute the dollars already in place. New wealth is a result of exploitation of natural resources.

Energy minerals - coal, oil and gas, and to a lesser extent uranium - are most important. Those states rich in energy resources are very well-off, i.e., Alaska, Texas, etc. The geology of the Northwest, and Washington in particular, is not all that unfavorable, in spite of the fact we've had no production. I would like to make a plea for increased concern for more oil and gas exploration here in Washington. The DNR is the major agency that controls the economic and political environment for oil and gas exploration.

All EIS's tend to be negative and play down the positive. I emphasize that oil and gas are important here in Washington. As we have no production, the impacts are not of that immediate importance; whether or not we get production depends upon the political and economic environment.

Program Prologue I see no recognition in the EIS of what I just mentioned. This is a generic complaint, however. You see it in every EIS that deals with natural resources. The stage is not set and doesn't imply that an important resource is being dealt with. There should be a statement that sets the stage for the entire EIS and one that recognizes the importance of the industry we are talking about.

Garth Tallman, Garth Tallman Associates
Portland, OR, January 9, 1985 (Reference Code H5)

NOTED The EIS sends out some negative signals to the industry but that's to be expected from an area like the Northwest. It is important in terms of encouraging exploration in the Northwest to send out as many positive signals as possible to the industry to let the industry know that, indeed, Washington and the Northwest are open for business in terms of oil and gas exploration, and it would be fallacious to assume that the oil companies are just going to come up here because there's potential. All of us like to think there's oil and gas potential, and certainly I think there is, and I think the consensus among geologists is that there is tremendous potential. One of the damaging things that can occur is that the industry can be very fickle. Specific companies can be very fickle and get turned off to an area very quickly, and that was very well evidenced by the state sale back in April of last year. To amplify a bit on what Marshall said, I think anything that the state can do to let industry know that they want to work with the industry as far as trying to encourage exploration I think is a positive thing and I think it will help the oil companies, particularly the majors, take a little bit different view of this area. On the positive side I might say that the meeting held on September 20 between the industry and DNR I consider to be a very positive step. The feedback I've had from my clients and others that participated has been very positive. The important thing there was the general consensus among the industry is that the state wants to work with the industry and it gave them the feeling that really some positive changes could be made. It's not so important necessarily the state do everything the industry wants to do. If it did you wouldn't even have an EIS. But there's got to be a compromise position somewhere, and I think by working together in the spirit of cooperation as apparently has been done since September 20 I think is a positive thing. The bottom line is to try to send out some positive signals to the industry as opposed to negative signals and try to let the industry know that there's room for give and take, and that there are some positive elements in terms of exploring up here as well as negative elements. Thank you.

WRITTEN COMMENTS

Letters from Federal Agencies

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
2625 Parkmont Lane S.W., Bldg. B-3
Olympia, Washington 98502

February 4, 1985

Mr. Kenneth Solt, Division Manager W1
Lands Division
Department of Natural Resources
Olympia, Washington 98504

Re: Draft Programmatic Environmental Impact Statement (PEIS) and Proposed Washington State Oil and Gas Leasing Program

Dear Mr. Solt:

We have reviewed the above-referenced documents, which have been prepared pursuant to the State Environmental Policy Act (SEPA). We hope the following comments are helpful in strengthening the final PEIS and program plan prior to implementation.

The draft program provides an adequate overview of oil and gas leasing plans on lands managed by the Department of Natural Resources (DNR). We support the wetland protection, phased environmental review and sensitive area planning steps outlined in the documents as essential leasing program elements.

We believe the draft PEIS and program plan could be primarily strengthened by clarifying necessary notification and interagency coordination and planning procedures that are briefly discussed in the draft documents.

NOTED The draft PEIS and program plan do not cover leasing on private, Federal, or state-owned lands managed by other agencies. The documents also point out that all DNR-managed lands would be available for leasing on a case-by-case basis. Your existing system to categorically classify the environmental sensitivity of these lands would also be terminated upon plan adoption.

P45,48, 52,54 We believe it would be prudent to better outline pertinent review criteria beyond those discussed in the draft documents that would be applied by DNR during the application process that may preclude right of entry and lease approval. Furthermore, the documents could also be strengthened by highlighting DNR coordination procedures and describing what technical input mechanisms beyond the SEPA and right of entry permit review process will be available to provide input into oil and gas lease planning.

These concerns stem from the fact that we find the documents unclear as to access and lease review procedures to be implemented for selected DNR- lands leased by the Fish and Wildlife Service (FWS) as Federal wildlife refuges. In one instance, for example, these leased refuge lands support a population of the Columbian white-tailed deer, which is a Federally endangered species.

P53 The FWS strongly encourages early notification regarding permit and lease applications involving lands we lease, or in the immediate vicinity of other FWS- managed refuge and fish hatchery facilities. To facilitate this early coordination, enclosed is a
NOTED current directory listing addresses of FWS refuge and fish hatchery facilities in Washington.

NOTED If Federal fish and wildlife concerns arise as a result of preliminary investigation and leasing proposals, this office would be prepared to work with your staff and potential applicants to resolve them.

NOTED A separate and additional evaluation would also be conducted by the FWS, for proposed oil and gas activities subject to Federal permits for which we have review and issuance responsibilities. This office would conduct an evaluation pursuant to the Fish and Wildlife Coordination Act and the Endangered Species Act, if exploratory or development activities require permits from the U. S. Coast Guard or the U. S. Army Corps of Engineers. These statutes would also apply to the issuance of Special Use permits that would govern refuge land access. It should be noted that in these evaluations, the FWS may concur, with or without stipulations, or object to the work, depending upon whether wetlands or other important fish and wildlife may be directly or indirectly affected.

P43,48 E12,17 We also note that the proposed resource protection actions outlined in the draft PEIS are directed primarily toward State listed endangered species. This action, although appropriate, appears to downplay balanced protective consideration of other ecologically and economically important fish and wildlife in the leasing process. The final PEIS should better address this issue and clarify how impacts to other important species will be avoided.

E22,24, 44,63, 72,76 Additional mitigation measures beyond those outlined in the draft PEIS are also merited, if accelerated exploration activities are foreseen as a result of program implementation. For example, access road alignment plans and seismic survey methods that pose the least environmental damage should be relied upon to avoid impacts to wetlands, and salmon spawning and wildlife breeding areas. Netting and fencing of mud and settlement ponds may also be necessary to preclude waterfowl and wildlife entry. A more effective oversight process is probably merited of drill cutting, mudpit, and byproduct waste water treatment and disposal, especially in high rainfall areas or locales with a potential for overflows and leaching to surface and subsurface waters.

In summary, we believe additional steps could be taken to further spell out and clarify notification procedures and resource protection and mitigation measures in the final documents.

Thank you for the opportunity to review and comment on these draft documents prior to program implementation. We would also appreciate receiving a copy of the final PEIS and adopted oil and gas leasing program plan.

Sincerely,

David J. Stout

David J. Stout
Acting Field Supervisor

cc: RO-AHR
SE-Olympia
CWTD NWR
BIA
EPA
WDE
WDF
WDG

IN REPLY REFER TO:
Land Services

United States Department of the Interior

BUREAU OF INDIAN AFFAIRS
PORTLAND AREA OFFICE
POST OFFICE BOX 3785
PORTLAND, OREGON 97208

JAN 16 1985

W2

Mr. Kenneth E. Solt
Manager, Lands Division
Department of Natural Resources
Public Lands Building
14th and Water Street
Olympia, Washington 98504

Dear Mr. Solt:

We have reviewed the Proposed Oil and Gas Leasing Program and Draft Environmental Impact Statement for potential effects on Indian lands and trust resources and offer the following comments.

NOTED Implementation of the proposal with adequate monitoring and consultations, when required, with adjacent land owners should provide appropriate control and consideration of environmental and socio-economic concerns.

Sincerely,

Acting Assistant Area Director
(Program Services)

Letters from State Agencies

JOHN SPELLMAN
Governor

JACOB THOMAS
Director

STATE OF WASHINGTON
OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION
111 West Twenty-First Avenue, KL-11 • Olympia, Washington 98504 • (206) 753-4011

December 6, 1984

Mr. Kenneth E. Solt
Division Manager, Lands Division
Dept. of Natural Resources, QW-21
Olympia, WA 98504

W3

Log Reference: 590-S-DNR-07
Re: Oil & Gas Leasing Program

Dear Mr. Solt:

NOTED A staff review has been conducted of your proposed oil and gas leasing program and the accompanying draft programmatic environmental impact statement. We believe the document could substantially benefit from additional consideration of archaeological and historic preservation concerns. Specifically, it is important to note that Department of Natural Resources (DNR) managed lands, to our knowledge, have never been subject to a comprehensive systematic professional archaeological and historic survey. In the absence of survey activity and resulting information, DNR data files will not accurately indicate if state managed archaeological and historic sites will be impacted by proposed activities.

We would be happy to meet with you and your staff to discuss the development of an active program to meet DNR's goals to "administer the Oil and Gas Leasing Program in a manner that identifies and protects cultural resources." We have enclosed a copy of a proposed Cultural Resource Management Program for Oil and Gas Leasing for your consideration and review.

NOTED We would note that there are several benefits from implementing this type of program. Most importantly, it assures that an active program will be undertaken to assure that state managed archaeological and historic sites will be found, evaluated, and considered as part of the environmental decision-making process. Second, it clearly identifies the process and the consultation requirements that will be followed for all leases. Third, it mirrors the program our office has developed for oil and gas leasing requiring federal permits or leasing and

thus will provide a uniform, predictable program for all lands within the state.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(206) 753-4405

dw
Enclosure

CULTURAL RESOURCES MANAGEMENT PROGRAM
Stipulations for Oil and Gas Leasing

GENERAL PROCEDURES

The Cultural Resources Management (CRM) Program shall be governed by the standards, principles, criteria, and definitions described in the following state and federal regulations and publications as applicable:

1. Archaeology and Historic Preservation; Secretary of the Interior's Standards and Guidelines (survey, data recovery, curation, and professional qualifications).

2. 36 CFR 63 - Determinations of Eligibility for Inclusion in the National Register of Historic Places (including guidelines for level of documentation to accompany requests for determinations of eligibility for inclusion in the Register).

3. 36 CFR 800 - Procedures for Protection of the Cultural Environment (criteria of effect and adverse effect).

4. Advisory Council on Historic Preservation. Treatment of Archaeological properties: A Handbook (guidelines for the development of mitigation procedures).

5. State of Washington Resource Protection Planning Process Archaeological and Historic Comprehensive Plan.

The CRM Program will include the following elements:

1. Identification
2. Evaluation of Significance
3. Evaluation of Effect
4. Implementation of Mitigative Measures

Prior to undertaking any surface-disturbing activities on the lease or off-lease lands used in exploration and development activities associated with the lease, the lessee or operator, unless notified to the contrary by the authorized officer of the Department of Natural Resources (DNR), with the concurrence of the State Historic Preservation Officer (SHPO), shall:

1. Identification

    a. Describe and identify the location of surface-disturbing areas.
    b. Engage the services of a cultural resource specialist acceptable to DNR and the SHPO to conduct a cultural resource inventory of those areas detailed in 1.a. The operator may elect to inventory an area larger than the area of proposed disturbance to cover possible site relocation which may

result from environmental or other considerations. An acceptable inventory report is to be submitted to the authorized DNR officer and to the SHPO for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface disturbing operation is submitted.

c. Upon review of the inventory report by DNR and the SHPO, should questions arise concerning the adequacy of the survey coverage, sufficient additional surveys shall be performed to resolve these questions.

2. Evaluation of Significance

Evaluate the National Register eligibility of all sites discovered during the investigations detailed under Section 1.b.

3. Evaluation of Effect

Pursuant to the process established in 36 CFR 800, obtain evaluations of effect for all National Register eligible sites within the surface-disturbing impact area.

4. Implementation of Mitigative Measures

a. Prepare a mitigation plan and research design for DNR and SHPO approval for sites which are determined eligible under Section 2 and which will be subject to adverse effects as determined under Section 3. Mitigation may include the relocation of proposed lease-related activities or other protective measures and data recovery measures such as excavation and recordation. Avoidance through relocation is the preferred mitigative option and, where avoidance is neither prudent nor feasible, data recovery, protective measures, and recordation will be considered. Where impacts to archaeological and historic sites cannot be mitigated to the satisfaction of DNR and SHPO, the lessee agrees to no surface occupancy within the boundaries of the site.

b. Implement the approved plan prepared under Section 4.1.

c. The lessee or operator shall immediately bring to the attention of the authorized officer of DNR and the SHPO any cultural resources discovered as a result of the lease. Such resources shall be tested and evaluated for State and National Register eligibility. For those sites determined to be eligible, evaluation of effect and mitigation measures shall be developed as outlined under Sections 3 and 4.

5. All artifacts, supporting data, and records resulting from this CRM Program will be curated in accordance with generally accepted practice and all applicable regulations. All data will be made available to qualified or professional archaeologists during regular working hours at times prearranged with the director of the repository.

JOHN SPELLMAN
Governor

DONALD W MOOS
Director

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Mail Stop PV-11 • Olympia, Washington 98504 • (206) 459-6000

January 11, 1985

Mr. Kenneth Solt
Department of Natural Resources
Mail Stop QW-21
Olympia, WA 98504

W4

Dear Mr. Solt:

Thank you for the opportunity to review the draft programmatic EIS for your oil and gas leasing program. We offer the following comments:

P31,55, A-1 E71,80, 81,123 1. The EIS needs to discuss the designation status of drilling muds and produced waters (Chapter 173-303 WAC). Applicants should be aware that, depending on the substances involved, these muds may be designated dangerous waste and require special handling on site (please contact Mr. Ross Potter, 459-6303).

E76 2. Oil rig construction and mud pit design and operation may be subject to construction constraints under Chapter 173-240 and 173-303 WAC.

NOTED 3. We remain concerned about possible ground water contamination due to the drilling process. There is also the potential for aquifer interchange and/or depletion due to interaquifer transfer from high to lower head zones resulting from improper construction or abandonment of test wells. To keep the Department of Ecology informed and to ensure proper protection of ground water, we suggest the applicant contact the appropriate WDOE Regional Office prior to beginning drilling operations. This would be in addition to our review of the environmental checklist and any permit applications.

NOTED 4. The environmental checklist for each proposal should indicate the specific effects of explosives for seismic exploration, including transportation and storage of explosives, chemical characteristics and strength, amounts in inventory, amounts used per test, frequency of use and areal coverage per test, and types of geologic structures subject to long-term compression or expansion.

P21 E29 5. It would be helpful if the EIS could indicate the general areas where exploration activities may occur.

Sincerely,

Greg Sorlie, Supervisor
Environmental Review and
Permit Management Section

GS:pk

cc: Jerry Louthain, SWRO
Roy Anderson, ERO
Dave Nunnallee, NWRO
Clar Pratt, CRO
Fred Hahn, External Affairs
Ross Potter, Dangerous Waste

JOHN SPELLMAN
Governor

WILLIAM R. WILKERSON
Director

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
115 General Administration Building • Olympia, Washington 98504 • (206) 753-6600 • (SCAN) 234-6600

January 14, 1985

Mr. Kenneth E. Solt, Division Manager
Lands Division
Department of Natural Resources
Olympia, Washington 98504

W5

Dear Mr. Solt:

Proposed Oil and Gas Leasing Program, Draft
Environmental Impact Statement Statewide

We have reviewed the above-referenced program and Draft Environmental Impact Statement (DEIS). We support your programmatic approach to analyzing the environmental impacts of leasing Department of Natural Resources (DNR) lands for oil and gas exploration. Specific comments follow.

Proposed Program

E71,80 Page 31 You mention water produced from wells being disposed of in streams. We strongly discourage this practice. We encourage strict monitoring of discharges to insure compliance with state water quality standards. In addition, the quantity of additional water disposed of should not be excessive. Sudden large surges of flow may in some cases stimulate movement of adult or juvenile salmon into newly inundated areas where they may become stranded as the flow recedes. Also, large introduction of flow may cause bank scour and sedimentation of local downstream habitats.

NOTED Page 39 We are encouraged that the program is committed to involving interested agencies and professionals in your decision making process.

P46 Page 46 We feel Type 3 waters should be included as sensitive areas.

NOTED Page 50 and 52 To allow us to evaluate the impact of a proposal, at a minimum the checklist should include a site map with contours, site-specific plan, at least some indication of amounts of cut and fill if any, location of surface water, and vegetation on the site. It would be ideal to include the site-specific plan of operations with the checklist but this may be "putting the cart before the horse."

P53 Page 53 The flow chart should include notice of surface owners and other agencies with a Declaration of Significance (DS) as well as with a Declaration of Non-Significance (DNS) (upper left, 6th step). Also, notice of application for shothole seismic survey or drilling should include the Department of Fisheries.

NOTED Page 55 It is encouraging to see the oil and gas supervisor will perform monitoring inspections. Responsibility for compliance was not clear during previous leases.

Environmental Impact Statement

P44 Page 21 Road Construction - We do not concur entirely with the
E22 proposed alternative. We suggest the following, "all roads constructed for conducting examinations, drilling, development and production activities on premises leased for oil and gas purposes shall meet or exceed road construction and maintenance standards as specified by the Forest Practices Board (Ch. 222-24 WAC)." This is consistent with the DNR's Forest Land Management Plan and encourages the DNR to manage these leases with the Forest Practices WAC's as the minimum standard, not the norm.

E59 Page 57 The 200' minimum distance from Type 1-4 waters for vibratory surveys is arbitrary. Have any studies been done to determine if "no significant impacts to anadromous fish embryos are anticipated" is an accurate statement.

NOTED Page 61 A "Redd" is a single salmonid spawning nest. Both anadromous and resident embryos could be affected by acoustic shock. Eyed stage for salmonids varies with and among salmonid species spawning timing. Depending upon species, race and location, eyed stage could occur in every month of the year. For example, spring chinook salmon spawn in August and September; fall chinook spawn in September, October and November; chum salmon spawn from August to March; and coho salmon spawn from September to January; some species of trout are spring spawners while others are fall and winter spawners, and some steelhead are spawning as late as June.

NOTED Page 62 As with vibratory shock, have any studies been conducted to substantiate this conclusion. If not, it is incumbent upon DNR to conduct such studies before speculating what the impacts might be.

Page 62 As with vibratory shock, have any studies been conducted to substantiate this conclusion. If not, it is incumbent upon DNR to conduct such studies before speculating what the impacts might be.

With the exception of the preceding comments, we concur with the contents of the program and DEIS. To reiterate, we feel the keys to the success of this program is well prepared checklists or supplemental EIS, strict and frequent monitoring and enforcement of lease provisions and strict compliance with existing environmental laws.

Thank you for the opportunity to comment.

Sincerely,

Millard S. Deuser

William R. Wilkerson,
Director

cc: Game
SEPA File
Trosper

JOHN SPELLMAN
Governor

FRANK LOCKARD
Director

STATE OF WASHINGTON
DEPARTMENT OF GAME
600 North Capitol Way, GJ-11 • Olympia, Washington 98504-0091 • (206) 753-5700

January 16, 1985

Mr. Art Stearns
Department Supervisor
Department of Natural Resources
Olympia, Washington 98504

W6

DRAFT ENVIRONMENTAL IMPACT STATEMENT: Proposed Oil and Gas Leasing Program

Dear Mr. Stearns:

Your document has been reviewed by Department of Game staff as requested; comments follow.

We commend you for including resource protection measures in your proposed program. Most significant among these are your goal (p.11) to ... "Protect from and reduce or eliminate losses caused by erosion, pollution of ground and surface waters and disruption of wildlife habitat...", and your proposed policy (p. 14) to prohibit most impacting activities within 200 feet of wetlands and types 1, 2, 3 or 4 waters. Conscientious adherence to these principles would help protect the public's valuble fish and wildlife resources while allowing income generation for the trust.

However, other language in your document casts uncertainty on how protection measures would be applied. In all, we believe stronger commitments to impact-reducing measures should be made.

NOTED In contrast to wording of the program goal mentioned above, your specific resource protection policies (p. 19) focus entirely on endangered, threatened and sensitive species. It should be pointed out that certain economically important species, not counted among the protected categories, could also suffer significant impacts from oil and gas operations. Losses of these animals would be felt by local communities as recreational expenditures decreased. A specific example of this type of resource is the Colockum elk herd. We believe that your program should include measures to reduce these impacts.

P3,5, 44 In addition, it is unclear how your standards of protection for threatened and sensitive species would apply. The qualifier, within trust obligations, is not informative enough to predict specific outcomes when plants and animals are at risk. Furthermore, to "consider" avoiding or lessening impacts on sensitive species does not imply any performance standard. It is clear that your income

generation and resource protection mandates potentially conflict. However, not enough information is given to judge how you would resolve these conflicts in practice.

NOTED Overall, we recommend that you add stronger, clearer language to your final EIS. Where you state that consultations with Game Department biologists may occur, we urge that you commit yourself to making them at appropriate points of the leasing/drilling process. In addition, some mechanism should be designed for acceptance and use of new resource information as it is developed. The Heritage data base is not comprehensive. Another issue of specific concern to us is your policy toward oil and gas activity on lands where Department of Game leases surface rights and uses the parcels for wildlife habitat and recreation. Notification, consultation and balance of resource/trust obligations are not clearly delineated in your document. These are public, as well as interagency issues. We urge you to include this information in your final EIS.

Specific comments follow:

Page 11, Natural Resource Goals (2) . Again, this goal is commendable, especially in that protection is not restricted to habitats of endangered, threatened and sensitive species.

NOTED Page 13, paragraphs 4 & 5 . We question whether it is realistic or desireable to act on the assumption that activities will probably not occur on leased parcels. What reliances are made and rights granted when leases are executed?

Page 13, Leasing of Aquatic Lands . We agree that this issue deserves special scrutiny.

P43,53 Page 16, Notification of Oil & Gas Leasing . Concerning those lands managed by your agency and leased by Department of Game, we would prefer the earliest possible notification. Our use of these parcels would often conflict with oil & gas activities. Does notification to surface owners of record imply notification of leaseholders?

P43,50 Page 18, Right of Entry . It is not clear how rights of entry are to be coordinated with surface leaseholders.

NOTED Page 19, Plants and Animals . Again, we recommend stronger, clearer standards.

P49 Page 20, paragraph 2 . This rationale for avoiding inventories applies to your policy for endangered species protection as well. Occurrence data in the Heritage system are not comprehensive. Consultations with Game Department biologists are important in this context, and some studies may be unavoidable.

NOTED Pages 21, 22, Road Construction . Placement can be as important as construction technique for avoiding impacts from roads. With oil & gas operations, road building is a major issue. We urge consultation

with Game Department biologists and full implementation of mitigating measures.

NOTED Page 61, Plants and Animals, paragraph 1 . Impacts from drilling rigs, service trucks and survey personnel would not be limited to threatened and endangered species.

NOTED Page 62, paragraph 2 . Because your conclusion is tentative, protective timing restrictions and/or implementation of monitoring studies would be appropriate.

E59,64 Page 62, paragraph 5 . Consultation should be carried out with Department of Game biologists for fish species under our jurisdiction.

NOTED Page 77, Runoff/Absorption . In the last four years, at least two mud pit overflows have reached surface waters in the state of Washington. Impacts from these occurrences should be discussed fully in your document.

E81 Page 78, Plants and Animals . Alternative mitigating techniques are feasible for avoiding open mud pit impacts on wildlife. In areas and at times of high waterfowl use, we strongly recommend the use of netting over mud pits. This method has proven to be effective. In addition, an experimental sonic repulsion method is being tested, and may also offer effective mitigation.

Thank you for giving us the opportunity to respond to your document. We hope our comments are helpful for preparation of your final EIS.

Sincerely,

295

THE DEPARTMENT OF GAME

Larry Lennox
Deputy Director

JW:jt

JOHN SPELLMAN
Governor

KAREN RAHM
Secretary

STATE OF WASHINGTON
DEPARTMENT OF SOCIAL AND HEALTH SERVICES
1409 Smith Tower, B17-9 • Seattle, Washington 98104

December 19, 1984

Kenneth E. Solt, Manager
Department of Natural Resources
Lands Division
Room 202 Public Lands Building
Olympia, Washington 98504

W7

Subject: Proposed Oil and Gas Leasing Program

Dear Mr. Solt:

I thank you for the opportunity to review the Proposed Oil and Gas Leasing Program. It is apparent that a solid effort is being made to strengthen the leasing process. For a specific department position on all or part of the program, I must refer you to our Operations Supervisor, Bill Liechty, at scan 243-5953, in Olympia.

P42,46
E72,81 I would, however, like to comment on a particular component of the Program from a District Engineer's perspective. Specifically, while the proposed process for reviewing and judging applications appears adequate, some concern remains for applications appearing in watersheds. The process now established tacitly allows for the possibility of extended drilling within a watershed. Granted, the review process should eliminate the problem applications. It seems, however, like the question as to whether a potentially dangerous (to the water quality) operation should even be allowed in the watershed is left begging. It shouldn't be.

I realize that the report was basically an outline and that details on the exact review process are omitted or missing. Thus if you feel there is other information I should be made aware of, please don't hesitate to contact me at scan 576-7673 or 576-7670.

Sincerely,

Lawrence W. Waters
District Engineer
Water Supply and Waste Section

LWW:bv
cc: Clair Olivers, City of Everett Water Dept.
Tim Haydon, City of Snohomish Water Dept.
Snohomish Health District
Bill Liechty, Olympia

Letters from Interested Tribes

Colville Confederated Tribes

P.O. Box 150 - Nespelem, Washington 99155 (509) 634-4711

COMMENTS

January 4, 1985 W8

COMMENTS : Colville Confederated Tribes
COMMENTING : Adeline Fredin, History/Archaeology Department
REFERENCE : page 20, and noted below for your review
REFERENCE : page 21, and noted below for your review
" PROPOSED OIL AND GAS LEASING PROGRAM: DRAFT EIS 1984 "
CULTURAL RESOURCES .....page 20,
Cultural resources are archaeological or historical sites such as the Indian pits and cairns on department-managed land near Stevenson."

"PROPOSED ACTION:"
"Adminster the Oil and Gas Leasing Program in a manner that identifies and protects cultural resources."

"ALTERNATIVE:"
"Make no special effort to identify or protect cultural resources. (NO Action)."

"DISCUSSION:"
"The proposed action will supplement the capabilities of the Office of Archaeological and Historic Preservation (OAHP) which will reduce the risk of accidental damage or destruction of cultural resources. Methods to identify and protect them will be part of the oil and gas leasing process. Department managers, because of additional training and knowledg, will be able to adjust proposed activity, avoiding needless damage."

"Alternative makes no special effort to identify or manage cultural resources. Instead, it relies intirely on OAHP for identification and management direction. Since OAHP is understaffed and underfunded, this would reduce the department's ability to protect cultural resources."

COMMENTS: TO Draft IES 1984, PROPOSED OIL AND GAS LEASING PROGRAM

It appears there is a lack of communication between law, and regulation for the protection of the cultural resources by the oil and gas proposed leasing program. The Colville Tribe as one of the first natives to the State of Washington area, has a definite intrest in the management for cultural resources, and the enviornment necessary to support what had been the Indian way of life. Cultural resources are a none-renewable resource, and represent humdards and thousands of years of information important to the history and culture of the Indian people. The tribe has incuraged the management policys, law, and regulations governing the protection and preservation of the cultural resources intrusted to OAHP. OAHP is awar that most of the tribes throughout the State of Washington were relocated to lands away from their own traditional area, and these lands became managed by the State. With the relocation of tribes, they were forced to leave behind valuable resources unique only to their

history. These are the resources that oftan become adversly effected by land development, with littal concideration or concern for the destruction of the information scientific or culturaly.

RECOMMENDATION:

P47,49 That there be a more positive policy by the proposed oil and gas leasing program to impliment laws and regulations protecting and preserving archaeological resources. 36 CFR Part 800, Part 63 including those regulations identified by OAHP, and those agencys that may be able to lend assistance to proper management of the Cultural Resources.

" PROPOSED OIL AND GAS LEASING PROGRAM " 1984

"Heritage Protection, Section"

Endangered, Threatened and Sensitive Species"

1. Endangered;
2. Threatened;
3. Sensitive ;

"Aboid impacts on plant and animal species considered indangered. Within trust obligations, avoid impacts on species considered Threatened and consider avoiding or Lessening impacts on species considered sensiteve.".....found on page 48

"NATURAL AREA PRESERVES AND THE REGISTRY PROGRAM".....found on page 48
"CULTURAL RESOURCES .....found on page 49

"parigraph two under CULTURAL RESOURCES "These sites and objects are protected by federal and state law, including the National Historic Preservation Act (Public Law 89-665 as amended), the Federal Archaeological and Historic Preservation Act of 1974 (P.L.93-291) and the State Archaeology and Historic Preservation Act (Ch. 27.34 RCW)."

COMMENTS: The laws are quoted here, but the policys to impliment the laws and regulations are missing, it may be an oversight, or it may be that the method to impliment the regulations are in a volium I have not seen. At any rate the tribes throughout the State of Washington have given up countless acres of land for occupation, development and new indestries. The story is continually repeted of inadvertant or deliberate destruction of cultural resources important to the sience and to enable the tribes to know more about their own history and culture.

page 3, CCT Comment, From Adeline Fredin, director History/Archaeology Dept;

P49 **RECOMMENDATION:** A section directed toward management policys for protection and preservation of cultural resources determined eligible for mitigation. Preservation of information in the event that the resources are detemined eligibile, and that the project can-not avoid the site/s. Consoltation with tribes presently knowen to have occupied the land in the event that mitigation also includes prehistoric burials, sacred sites, or ceremonial sites. The tribe should also be allowed copys of the resulting reports, studys, documents, digrams, maps, as part of their right to better know their ancesterol heritage.

Adeline Fredin

Adeline Fredin

Letters from Local Government

January 11, 1985

CITY OF
everett
PUBLIC WORKS DEPARTMENT
3200 CEDAR STREET
EVERETT, WASHINGTON
98201

Mr. Kenneth Solt
Division Manager, Lands Division
Department of Natural Resources
Olympia, Washington 98504

W9

Subject: DNR's PEIS for Oil and Gas Leasing

Dear Mr. Solt:

Thank you for the opportunity to review your proposed Oil and Gas Leasing Program and draft Programmatic Environmental Impact Statement (PEIS). The City's position on oil and gas leasing in our municipal watershed (the Sultan River Basin) has been communicated to the Department of Natural Resources in two previous letters addressed to Mrs. Hixon, your Environmental Coordinator (dated February 6 and February 14, 1984).

The City is still concerned about all issues raised in our two previous letters. In addition, we would like to offer the following comments on the PEIS:

P45 1. Repeated reference is made to a Plan of Operations that all leases must provide to the DNR. This plan appears to be a critical tool in anticipating and mitigating any potential problems that might arise during oil and gas exploration activities. The City would like to be involved in the formulation of all operation plans for explorations within, or near, our municipal watershed (a watershed map is attached) prior to their approval by the DNR.

E82 2. On Page 71, it is stated that only six blowouts have occurred in California between the years 1970 and 1980. Although this indicates that the probability of a blowout is low, there still should be a discussion of the impacts of a blowout and proposed mitigation techniques if a blowout does occur.

P44 E72,81 3. On Page 82, it is stated that liquid waste may be injected into subsurface strata where the local groundwater is of equal or poorer quality than the liquid waste. Groundwater quality should be tested during the formulation of the operations plan, so it can be determined prior to permit issuance if liquid injection will be feasible.

STREETS 259-8820 | TRANSIT 259-8896 | MOTOR VEHICLES 259-8777 | BUILDING 259-8745 | PUBLIC SERVICES 259-8811 | UTILITIES 259-8820 Water/Sewer/Drainage | CONSTRUCTION INSPECTION 259-8811 | ENGINEERING 259-8811 | TRAFFIC 259-8811

P42,46 4. Directional drilling is suggested as the method to avoid surface disturbances within municipal watersheds, and still extract oil and gas from within the municipal watersheds. Everett's watershed (the Sultan River) and the City of Snohomish's watershed (the Pilchuck River) are adjacent watersheds. Directional drilling in this case will, therefore, still result in surface disturbances within a municipal waterhsed. This points out the need for a detailed comprehensive analysis of oil and gas leasing/exploration in our watershed, instead of the general guidelines presented in the proposed leasing program and PEIS.

Again, thank you for the opportunity to comment on the proposed leasing program and PEIS.

Sincerely,

Alfred R. Theal

ALFRED R. THEAL, P.E.
Public Works Director/City Engineer

DM/jcl

cc: Ray Lasmanas, Oil and Gas Conservation Committee Supervisor
Jack Hulsey, DNR Area Manager
Bob Landles, City of Everett Environmental Coordinator

Attachment

Jefferson County
Planning and Building Department

county courthouse
port townsend, washington 98368
telephone 206| 385-1427

david goldsmith, director

December 13, 1984

W10

Mr. Kenneth Solt, Division Manager
Lands Division
Washington State Department of Natural Resources
Mail Stop QW-21
Olympia, Washington 98504

Re: Proposed Oil and Gas Leasing Program

Dear Mr. Solt:

This office has reviewed the Washington State Department of Natural Resources' proposed Oil and Gas Leasing Program and offers the following comments:

P45 1. Page 45, "Sonsitive Area Planning." The concept of giving special atttention to sensitive areas is a good one. The document, however, devotes much effort to defining what a sensitive area is without describing how the area will be treated differently in the planning process. This should be clarified in the final document.

P56 E85 2. Page 56, "Reclamation." This is the only section devoted to reclamation requirements. We consider reclamation to be a most critical part in the oil and gas extraction process and one that is often overlooked. The final plan should address requirements such as the need for a reclamation plan, reclamation standards, and a timetable for reclaiming lands. If these standards are contained in another document, they should be referenced.

Generally, we found the document to be informative and provide a timely, methodical process for obtaining an oil or gas lease. Addressing the two areas described above would make the document more complete and clear.

Sincerely,

Mitch Press
Associate Planner

MP:ve

King County Executive
Randy Revelle
Department of Planning and Community Development
Holly Miller, Director

January 18, 1985

Mr. Kenneth E. Solt, Division Manager W11
Lands Division
Mail Stop QW-21
Department of Natural Resources
Olympia, Washington 98504

RE: Proposed Oil and Gas Leasing Program - Draft Environmental Impact Statement

Dear Mr. Solt:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement (DEIS) for the proposed Oil and Gas Leasing Program. King County has followed the leasing program with considerable interest over the past two years and has provided the Department with recommendations on the scope of the leasing program, the assignment of sites into leasing categories and resource information on proposed lease sites in King County.

We appreciate the Department's efforts to accommodate our previous concerns on this important program. I hope the following comments assist you in developing the Final EIS and in designing mitigation measures to protect important natural and environmental resources on and adjacent to State managed lands.

The following comments supplement the oral comments provided by Dave Clark of my staff at your public meeting in Issaquah on January 8, 1985.

Relationship to Other Oil and Gas Regulations

P7,15, 44,53, 54 It is not clear how the policies and regulations promulgated in the Oil and Gas Conservation Act (RCW 78.52) and the activities of the Oil and Gas Conservation Committee relate to the policies proposed under this action. For example, could the proposed policies and regulations be conflicting with and/or more stringent than those existent under current statutes? Are amendments to the regulations and procedures implementing RCW 78.52 expected as a result of the regulations resulting from this action? Are changes proposed to the Department's Plan of Operations requirements? Will the policies and guidelines recommended from this (DEIS) be adopted as WAC amendments or as administrative procedures? The Final EIS should clarify these relationships and the process the Department will use to adopt the proposed policies and regulations.

811 Alaska Building 616 Second Avenue Seattle, Washington 98104 (206) 344-7503

Management Goals

NOTED One of the overall management goals for the Oil and Gas Leasing Program proposes that natural resources on State lands be conserved and enhanced. Other than enhancing the availability of the State's oil and gas resources and resultant financial yields to the State from required leases, what other levels and types of resource enhancement are expected from the proposed program?

Lands Available for Lease

P42 EI3 Alternative Two, which establishes a "three category system" for classifying Department lands available for lease based on degree of sensitivity, appears to provide a reasonable level of protection for important natural resources without unnecessarily encumbering the State's trust mandate. Absent in this and other proposed alternatives however, is a means by which State lands clearly exhibiting greater value for other natural resource purposes can be selectively and permanently excluded from future oil and gas leases (e.g., lands with endangered or threatened species, lands having a majority of the parcel identified as a sensitive area). Substantial data is currently available in King County on environmental resources and sensitive areas which could be used to eliminate sites from lease consideration prior to conducting expensive, site-specific environmental analyses as is proposed under the leasing program.

Buffers for Waterbodies and Wetlands

P45 We do not believe a 200 foot buffer around water bodies and wetlands by itself, provides sufficient protection for aquatic resources and riparian habitats in all circumstances.

P45 The proposed policy should also consider seasonal restrictions which may be necessary in cases of spawning fish and nesting birds. Further, directional drilling which is permitted beyond the 200 foot high water mark could have significant adverse impact on wildlife due to noise and vibration which is not considered by the proposed policy.

Wetland Definition

P43,45 The definition of wetlands (WAC 344-12) used in the PEIS is considerably narrower than the definition used by King County in our wetlands management program or the Corps of Engineers/United States Fish and Wildlife Service at the Federal level. As a consequence, the majority of King County's designated wetlands (approximately 76 percent) are outside the scope of the protection afforded by the proposed 200 foot buffer. The WAC wetland definition is further complicated by the requirement for the wetland edge to be established from measurements landward from the ordinary high water mark. In practice, accurate determination of the ordinary high water mark in wetland areas is subject to substantial uncertainty and ambiguity. Both King County and other Federal agencies managing wetland resources use the

existence of wetland plants, wetland soils and, to a lesser extent, the water regime to establish the wetland edge. We suggest the Department amend the proposed regulation as outlined in either a. or b. below.

a. Revise the WAC definition of wetlands to use the federal definition because of its widespread recognition and use by resource agencies, including King County, or

b. Add a provision to the proposed regulation which allows the Department to recognize and use wetland programs, which have been developed and are being implemented at the local level. We consider this to be a prudent approach since King County will apply its wetland regulations in subsequent review and permitting activities.

Notification of Oil and Gas Leasing

P7,53 Notification to counties and other affected local governments upon acceptance of oil and gas lease applications would provide the State with additional information that may not be known or obtainable from surface owners of record. This notification would not only alert the local jurisdiction to the impending lease but would also provide the State with the means to request environmental information from the local land use agency that could subsequently be used to condition the operator's Plan of Operations or other required permits.

Resource Protection

NOTED The proposed policy dealing with plants and animals implies that the State's trust management obligations would prevail over actions, such as lease prohibitions, which would protect species considered threatened or sensitive. The policy appears to be less restrictive than current policies of the Federal government affording protections to threatened or sensitive species. The proposed policy also raises considerable questions in situations where these species or their habitat overlap abutting parcels managed by the State and Federal agencies.

NOTED The DEIS notes that more stringent policy protections may not be warranted due to the very limited existence of endangered or threatened plants and animals on department-managed land. However, the reverse would be equally valid -- that such few species could easily be protected without excluding sizeable land areas from leasing or adversely affecting trust obligations. We believe the latter should be given further consideration in the Final EIS.

Seismic Exploration

P7,44,45, 53,E72, 76,82 We expressly request that the local land use agency be notified prior to any proposed explosive seismic exploration. Measures to control noise impacts on all aspects of exploratory investigations and drilling should be

P7,44, 45 given priority consideration where residential areas are in close proximity to the area of exploration.

Aquifer and Groundwater Protection

P7,44, 45,46, 55 E7,72, 80,81 Growing concern and pressure is being exerted on State and local governments to more agressively protect recharge areas and groundwaters used for public and private drinking water supplies. As noted in the DEIS, exploratory drilling may allow communication between aquifers, ultimately resulting in degraded water quality which makes groundwaters unsuitable for domestic use.

P45 E35,47, 63,71, 72 Policy and regulatory protections for these aquifers is not sufficiently developed in the DEIS. Much stronger safeguards, such as the leasing prohibitions proposed for wetlands and other water bodies, would seem to be just as appropriate for public water supply systems. Local land use agencies and water purveyors should be contacted for area-specific information on aquifers and domestic groundwater systems, and should be consulted in establishing water quality and quantity safeguards made as part of the Plan of Operations.

Thank you again for the opportunity to review the DEIS. If clarification of our comments is necessary or if you have additional questions, please contact Dave Clark at 587-4687. We look forward to continuing work with your agency on the Oil and Gas Leasing Program as specific sites in King County are proposed for site investigations and exploration.

Sincerely,

Holly Miller

HOLLY MILLER
Director

HM:DC:mlm
RP10B

cc: Brian Boyle, Commissioner of Public Lands
Bryan Glynn, Manager, Building and Land Development Division
ATTN: Ralph Colby, Chief, Plan Implementation Section
Diane Sheldon, Planner, Plan Implementation Section
Harold Robertson, Manager, Planning Division
ATTN: Martin Seybold, Chief, Resource Planning Section
Dave Clark, Planner, Resource Planning Section
Lois Schwennesen, Chief, Community Planning Section
Steve Boyce, Planner, Community Planning Section

San Juan County
Planning Department
P.O. Box 947 • Friday Harbor, Washington 98250 • 206/378-2354

November 29, 1984

Mr. Kenneth E. Solt
Division Manager
Lands Division
Mail Stop QW-21
Dept. of Natural Resources
Olympia, WA 98504

W12

Re: DEIS
Proposed Oil and Gas Leasing Program

Dear Mr. Solt:

San Jaun County offers the following comments:

NOTED 1. San Juan County is not included in the general areas listed as potential areas of oil and gas interest in the State of Washington.

P43 2. However, interest in drilling on the DNR aquatic land holdings may be expressed by oil or gas companies in the future, unlikely as that possibility may be now. We request that San Juan County be notified immediately when such an indication of interest is known to DNR. San Juan County is protected from surface drilling by RCW 90.58.160.

P43,46 3. The waters of San Juan County are held to be unique by the legislature above all others in the state. Since 1923, a marine biological preserve has been established for all the "salt waters and beds and shores of the islands constituting San Juan County and Cypress Island in Skagit County" (RCW 28 B.20.320). Preparation of specific EIS's for localized aquatic areas are called for under program resource protection planning. Recognition of the marine biological preserve should be included as a "selected sensitive area" factor in the EIS. Indeed the legal ramifications of RCW 28 B.20.320 might preclude any kind of drilling in San Juan waters.

Thank you for allowing San Juan County the opportunity to comment on the DEIS.

Sincerely,

Meg Fernekees

mm

c: Colonel L. Sorenson, Planning Director
Dennis Willows Director of Friday Harbor Labs

SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT No 1

2320 California St., Everett, Washington 98201 258-8211
Mailing Address: P. O. Box 1107, Everett, Washington 98206

January 14, 1985

PUD 16182

Mr. Kenneth Solt, Division Manager W13
Lands Division
Department of Natural Resources
Mail Stop QW-21
Olympia, WA 98504

Dear Mr. Solt:

RE: Proposed Oil and Gas Leasing Program on State Lands - Draft Programmatic Environmental Impact Statement

The interest of this utility in your proposed program focuses on protection of facilities of the Henry M. Jackson Hydroelectric Project. We do not object to the overall program. We present suggestions to improve coverage within both the EIS and subsequent Departmental administrative procedures.

P7,42, 45 Within the context of your proposed program administrative procedures, we feel that the State land under or on which our project facilities are located should be classified as Category II lands. That is, according to your definition (p. 12), "Tracts on which there is a potential for significant environmental impact." As we understand your proposal covering such lands, a leasing applicant would be required to prepare an environmental checklist and a plan of operations (p. 13). Therefore, we request that the following land sections be classified as Category II due to the siting of project facilities within them. The project area is shown on the enclosed drawing.

	Facilities	Sections
NOTED	Culmback Dam	29; T29N and R9E
	Power tunnel	29, 30 and 36; T29N and R9E and 2; T28N and R8E
	Power pipeline (buried)	3, 9, 10 and 17; T28N and R8E
	Powerhouse	17; T28N and R8E

	Facilities	Sections
NOTED	Lake Chaplain pipeline	5, 6, 8 and 17; T28N and R8E and 31; T29N and R8E
	Everett diversion dam, water pipeline and tunnel	31, 32 and 33; T29N and R9E

P7,43 45,52, 53 Seismic exploration and drilling are the two physical activities in the program that are of major interest to us. Recognition of the potential hazard of these activities to project facilities must be covered in administrative processing of any exploration permit for project areas. Appropriate protection requirements must be included in any permit for exploratory work in the Category II lands listed above and shown on the enclosed drawings. Also, any activity by the permittee must be consistent with pre-existing agreements and leases between the District and the Department of Natural Resources. In the context of proposed program language, the above statements constitute "site-specific conditions" regarding seismic exploration (p. 23).

E69 Stratigraphic and exploratory drilling alternatives and discussion is inadequate (pp. 23-24 and 66). Coverage is lacking of facilities at considerable depth underground, such as the Jackson Project's power tunnel. (A plan and profile drawing of this tunnel is enclosed also.) We suggest that a fifth alternative be added:

"5. Restrict stratigraphic and exploratory drilling in areas with subterranean facilities."

The need for this administrative option is obvious. The selection of it would be limited to special cases or instances where and when drilling could damage subterranean facilities. Your proposed program fails to recognize the potential problem. Our suggestion addresses this oversight.

E66,73, 85 There should, in our opinion, be DNR comments on environmental impact and mitigation measures under "Public Services and Utilities" regarding seismic exploration and stratigraphic and exploratory drilling. Facilities of our hydroelectric project have been designed to withstand seismic events (earthquakes). Therefore, if proper buffering is employed between facilities and seismic exploration shot holes, protection should be adequate. This specific assessment, however, must be made by the Department of Natural Resources and incorporated within this EIS, (draft p. 66). The same issue applies to buffering between drill holes and deep subterranean facilities at pages 70 and 82. We do not understand the oversight since our prior communication to you of June 25, 1984 specifically presented this issue. This is acknowledged in "Key Environmental Issues by Respondent" on pages iv and v. Snohomish County PUD is listed in the matrix.

The thrust and intent of our comments herein is to embed recognition and protection of hydroelectric project facilities within your administrative procedures, when and if implemented, for oil and gas exploration leasing on State land which may involve not only the Jackson Project but any other hydroelectric project in the State.

We appreciate your contacting us directly for commenting on the draft programmatic EIS.

Yours very truly,

J. D. Maner
Executive Director
Utility Operations

Enclosures (2)

SNOHOMISH
HEALTH
DISTRICT

Courthouse
Everett, Washington 98201
Area Code 206 259-9440

December 12, 1984

Kenneth E. Solt, Manager W14
Department of Natural Resources
Lands Division
Room 202, Public Lands Building
Olympia, Washington 98504

Re: Proposed Oil and Gas Leasing Program

Dear Sir:

We have reviewed the Proposed Oil and Gas Leasing Program and accompanying Draft Programmatic Environmental Impact Statement (PEIS). The following comprises our comments.

P42,46
E71,81 We are concerned about proposed leases within municipal watersheds. Both the Sultan Basin and Pilchuck Watersheds are vulnerable. Degradation could impact the water quality of half of Snohomish County's residents. Since we would oppose any drilling within these watersheds, we fail to see why exploration should be allowed in these areas.

We are available to discuss these concerns with you. We can be contacted at 259-0693.

Very truly yours,

C. H. Mangum

C. H. Mangum, R.S., Director
Environmental Health Division

CHM:RPS:jsf

cc: Department of Social and Health Services
City of Everett Water Department
City of Snohomish Water Department

DIVISIONS
Light
Water
Belt Line

Please address reply to:
City of Tacoma
Department of Public Utilities
P.O. Box 11007
Tacoma, Washington 98411
(206) 383-2471

City of Tacoma
WASHINGTON

1983-84
ALL-AMERICA CITY

DEPARTMENT OF PUBLIC UTILITIES
Paul J. Nolan, Director

December 18, 1984

W15

Mr. Kenneth Solt, Division Manager
Lands Division
Department of Natural Resources
Mail Stop QW-21
Olympia, Washington 98504

Dear Mr. Solt:

This agency has had an opportunity to review your Proposed Oil and Gas Leasing Program and the accompanying Draft Environmental Impact Statement, both dated November 1984, and we wish to comment on your Program. As you know, the City's domestic water supply comes from the Green River Watershed which is a 231 square mile, protected Watershed in southeastern King County. The land ownership is mixed with the Department of Natural Resources being a major owner. The City is able to use unfiltered water due to the pristine nature of the Watershed and due to the sanitary and environmental controls the City has established within the Watershed area.

P42,45, 46 Generally speaking, the City wants to make available the maximum use of the Green River Watershed's resources, consistent with the production of a pristine, unfiltered water supply. We understand that you have proposed a programmatic Plan and EIS for a state-wide leasing program and individual sites would be evaluated on their individual merit. Since the City of Seattle combined with the City of Tacoma's Watersheds serve over one-half the population of the State of Washington, we think both the Seattle Watersheds as well as the Tacoma Watersheds should be considered for designation as sensitive areas under your planning guidelines so that we are assured that extra precautions would be taken if it were necessary to drill in any of the cities' three Watersheds.

P7,45 In any event, we believe that any exploration or developmental drilling within these Watersheds should be subject to special sanitary operation provisions as well as special oil spill and other chemical spill provisions, along with a containment plan for such spills to insure that none of these minerals or chemicals will reach our precious water supplies. We would expect that Environmental Impact Statements would accompany such exploration and development plans, subject to the review of the affected cities.

In addition to these general comments we have itemized comments on both your Program and the Draft Environmental Impact Statement, as follows:

NOTED Program Document, Page 7 - We commend your attention to the Water Pollution Control Act, but we are concerned that accidental spills could occur that may not be properly provided for in your Plan.

Page 10 - We commend and support your oil and gas leasing program goal to protect from and reduce or eliminate losses caused by erosion, pollution of ground and surface waters and disruption of wildlife habitats.

P31 Page 31 - We noted that some of the drilling fluid additives may be caustic, toxic or acidic. We would ask that the use of any toxic additives within a municipal watershed be very closely evaluated before using them, both on the basis of spills at the drilling site, as well as possible spills while the materials are being transported to the drilling sites.

P7 Page 34 - You indicate that if surface water is disposed of underground it must meet the provisions of the Department of Ecology's Underground Injection Control regulations as well as the Federal Safe Drinking Water Act provisions to protect fresh water aquifers. We would hope that in your planning, surface water supplies serving the domestic population would be given the same considerations.

P46 Page 42 - Regarding lands available for lease we note that your Sensitive Area Planning process may identify lands that will be withheld from leasing and that it will be on a site-specific basis. It is our desire that three special considerations be given to both Tacoma's as well as Seattle's domestic water supplies.

NOTED Also on Page 42 - You note that some lands may be available for conditional leases, such as places where municipal watershed leases are in effect. If it's necessary to adequately protect our Watershed from oil drilling we would be interested in pursuing such a lease.

NOTED We also note on Page 42 that the Commissioner of Public Lands may withhold lands from leasing if he determines it would be in the best interests of the State. We would hope that the two cities' Watersheds be considered for such withholding if it appears that exploratory drilling or well development is too hazardous an activity to be conducted on these lands.

E72,81 Page 43 - We note that your Department has withheld the leasing of aquatic lands at this time. It is our general position that it may also be wise to withhold all or part of the domestic watersheds from leasing consideration until such time that it might be shown that drilling could proceed safely and with minimal or no risk to the environment.

P45 On Page 43 - Under Water and Wetland Areas - We note that drilling, development and production would be prohibited within 200 feet of certain streams. We would presume that this would also include the transportation of products to and from any sites also. The City of Tacoma presently has a one-half mile buffer strip on each side of its Green River supply and such buffer strip may be more appropriate in our large municipal watersheds regarding the production of oil and gas.

P54 On Page 43 - We note that you will be requiring a Plan of Operations for any exploration or drilling activities and we would hope that such a Plan of Operations would be subject to our review so that domestic supplies would be adequately protected from any drilling operations.

NOTED Page 44, under Resource Protection - We wonder if such protection should also be extended to the large watersheds at this time.

P46 On Page 45, under Resource Protection Sensitive Area Planning - We would appreciate your considering watersheds as part of the sensitive area planning process regarding oil and gas leasing.

NOTED Page 46 - We commend your including industrial or domestic watersheds under those situations that may be selected to be sensitive areas.

The next comments will be on the Draft Environmental Impact Statement.

NOTED Page iii - We commend your recognizing upfront that any development and production phase will require both an environmental checklist and may also require a site-specific supplemental Environmental Impact Statement to adequately protect our natural environment.

E82 Pages iv and v - We are very concerned with any accidental oil spills or chemical spills connected with your proposed program and in reviewing both your program document and EIS document, we feel the accidental spills are not yet adequately addressed as to their impact on the environment. What can be done about spills and what the short and long-term nature of such spills might be on the environment is not addressed.

NOTED Page 12 - Under Policies, Lands Available for Lease Alternatives - We wonder if the Seattle and Tacoma Watersheds could be included either in your Category II. or III., that is, Land Available for Restricted Leasing or Lands Withheld from Leasing.

P42,45, 46 E71,80 Page 15 - Under the first discussion - We strongly agree with your buffer strip concept. Within the municipal watersheds we feel that to minimize the risks you may wish to consider extending these buffer strips up to 1/4 or 1/2 mile away from any live streams. Such protection should also be considered for the transportation of any chemicals or products from the well site. We realize that such protection may not be possible or even desirable in all cases that might arise. We feel it is imperative for your Department to quantify the environmental damage from a "worst case" basis chemical spill while transporting materials to a drilling site within a watershed as well as quantifying and evaluating the effect of a theoretical oil spill from a typical oil well on our watersheds. Then, we can rationally evaluate the impact of such activities on our domestic water supplies. Either theoretical or real situations could be evaluated as to the effect on our natural environment.

NOTED Page 33 - Under Oil and Gas Leasing Program Goals - Again we strongly agree with your goal to "Protect from and reduce or eliminate losses caused by erosion, pollution of ground and surface waters and disruption of wildlife habitats."

NOTED Page 34 - Again, we note that some DNR lands are leased for municipal watershed purposes and if necessary to protect us adequately from oil and gas leasing we would be interested in such a lease.

NOTED Page 38 - Under Policies with a Potential for Environmental Impact, Natural Environment, Earth, Air, Water - You indicate that no significant impacts are anticipated. We strongly believe that, as mentioned before, your Department should take the time to try to evaluate the effect of either a major chemical spill or a major oil spill within a domestic watershed or within a certain number of feet from any live stream within the State of Washington and then we can rationally determine the impact of these proposed operations on our precious domestic water supplies. Also, on Page 39 under Built Environment, again you indicate that no significant impacts are anticipated. We believe that you should detail the impact of either a chemical spill or an oil spill, both on the terrestrial as well as the aquatic environment.

NOTED On Page 41 - Under Built Environment, Environmental Health - Once again you indicate that no significant impacts are anticipated and we wonder what the impact from a chemical spill or oil spill would be.

NOTED Page 71 - Under Exploratory Drilling - You appear to provide a great deal of protection against accidental well blowouts and we commend your efforts along these lines. This is one of the occurrences that we've all seen in the movies and of course it gives us a biased view towards the environmental hazard of oil and gas wells.

NOTED Page 77 - Under Natural Environment, Water, Runoff/Absorption - It is good to see that containment berms will be required surrounding the storage area for drilling mud materials. For our watersheds it may be necessary to have a containment plan in effect for the whole site as well as an evaluation of the effect of any chemical spills or oil spills while transporting materials to and from the sites.

NOTED Once again, we appreciate the opportunity to comment on your Program and your Environmental Impact Statement and we cannot overemphasize our feeling for the necessity of adequately protecting our domestic water supplies and for evaluating the possible effects of chemical or oil and gas spills within our domestic watersheds so that both we and the public can have adequate assurance that drilling can or cannot proceed safely within these watersheds.

Very truly yours,

KF Olson

Kenneth F. Olson
Superintendent
Water Division

KFO:CRM/smc

cc: Tom Spring, Seattle Water

Letters from Organizations

FRIENDS OF THE COLUMBIA
250 Earl Road
Moses Lake, WA 98837

January 9, 1985

Kenneth Solt, Division Manager
Lands Divsion
Department of Natural Resources
Mail Stop QW-21
Olympia, WA 98504

RE: Comments on Proposed Oil and Gas Leasing Program W16

Dear Mr. Solt;

NOTED I have read the document which is the draft Oil and Gas Leasing Program. I have not read the PEIS. I am submitting these comments on the first document because of the time constraints. I only have 5 days left to read and comment on the PEIS and may not be able to accomplish this project in a timely manner. Therefore I have read the program and wish to comment on the document at this time and hopefully I will be able to get comments to you on the PEIS at a later time.

P41 The background section of this document was extremely informative and well thought out. I did not understand fully the comment on pg. 9 which says "Integrate the needs of nontimber resources into the mangement of of the timber resource". This seems to place the timber resource on a level of higher importance then the other natural resources on DNR lands. Please correct this assumption by informing me of the correct meaning of this statement or change the document appropriately so that one resource does not tend to dominate others.

The introduction to oil and gas exploration development in Washington was again well developed and quite informative. I was quite surprised to see that only one oil well has been brought to production status. This fact is quite and eye opener taking into account the amount of activity and money generated from a program of this type. Naturally I am concerned about Columbia River Basins roll in this program. Also the recently scraped plans by ARCO for testing on the floor of the Columbia. Some of these soncerns may or may not be addressed in the implementation of this program. Irregardless it is apparent that there is interest in oil and gas deposits along the western rim of the basin.

P7 On page 24, Phases of activity, I am concerned about the waste disposal
E71,81 section of this part of the report. I do not support, under any circumstances, injecting polluted waters back into the strata. The fact that it lesser in quality does not affect the volume of such poor quality waters. I strongly support the method of evaporation listed on page 31. I advise that injection disposal procedures not be allowed, and absolutely no disposal be allowed in streams(2nd paragraph, left hand column). Evaporation from a surface impoundment is the best alternative suggested.

P7 In regards to the actual program, I am overall pleased with its content. I suggest on page 45, the following change be made: Public hearings will be used to gather additional information. Delete the words 'may also be used".

P7,45, In regards to resource protection I strongly recommend more space be allowed
48,52 for within the program to cover flora and fauna protection, in general.
E44 While the department has focused specifically, at length on threatened or endangered or sensitive areas and species, not much has been notated

about impacts on flora and fauna of the area. What has been notated seems to hinge greatly on determinations by the Commissioner as to the impact of such acitivites upon flora, fauna and wildlife habitats. I request that notation be specifically included that the commissioner will determine impacts upon the environment, through public hearings, and then make determinations. This removes some of the subjectivity which comes from the departments involvement in the overall program.

NOTED I also request that a greater amount of space be devoted to reclamation. A simple statement such as appears on p. 56-"...is contingent upon acceptance of the reclamation by the department and compliance with the terms and conditions of the lease." simply does not cover the subject adequately. I have seen firsthand USDA and USFS inspections on timber contracts and various other termination and release activites regarding lease terms compliance and the implied rules which allow for on the site flexibility by the contract officer almost always results in a deminishment of the resource or resources. I would like to see a more specific stating in this program of policies which the DNR proposes for its contract officiers to follow.

In general, I found the work to be informative, complete and only partly neglectful in specific instances. I urge that the department tighten its controls on the field staff in regards to compliance, set policies and spell out department policies to a far greater degree, allowing for little if any, on site flexibility by a single field person.

Your considerations of these comments is greatly appreciated.

Sincerely,

Stephen R. Frazier
Director-FRIENDS OF THE COLUMBIA

The Nature Conservancy

Washington Field Office
1601 Second Avenue, Suite 910, Seattle, Washington 98101
(206) 624-9623

January 15, 1985

W17

Kenneth E. Solt
Division Manager
Lands Division
Mail Stop QW-21
Department of Natural Resources
Olympia, WA 98504

Dear Mr. Solt:

I have reviewed the Proposed Oil & Gas Leasing Program and Draft EIS issued November 1984. As you may know, The Nature Conservancy is working closely with the DNR to preserve Washington's natural heritage. Also, under a cooperative agreement with the DNR, the Conservancy is implementing the Washington Register of Natural Areas Program.

NOTED It appears in the Proposed Oil & Gas Leasing Program and Draft EIS that there is some misunderstanding regarding the role of natural area registration in the state's overall natural heritage identification and protection plan. I recommend that you meet with Mark Sheehan, manager of the Washington Natural Heritage Program, to eliminate the confusion that seems to exist.

If I can provide any assistance in this effort, please let me know. I have enclosed a copy of a brochure for the Washington Register of Natural Areas Program. The entire Natural Heritage Program and its components are discussed most comprehensively in the DNR Washington Natural Heritage Plan.

Sincerely,

Laura Smith

Laura Smith
Field Representative

Enclosure

cc: Mark Sheehan

Western Regional Office
156 Second Street, San Francisco, California 94105
(415) 777-0541

National Office
1800 North Kent Street, Arlington, Virginia 22209
(703) 841-5300

Pilchuck Audubon Society
P.O. Box 1618, Everett, Washington 98206
January 14, 1985

Kenneth E. Solt, Division Manager
Lands Division
Mail Stop QW-21
Department of Natural Resources
Olympia, WA 98504

W18

Dear Mr. Solt:

These are our comments re: "Proposed Oil and Gas Leasing Program, November 1984."

Page 7:

NOTED 1. "...all reasonable and appropriate uses." While Chapter 90.58.020 RCW does state the above, the exclusion of further explanation leads to a false impression of the intent of 90.58.020 RCW. "This policy contemplates protecting against adverse effects to the public health, the land and its vegetation and wildlife...." This last sentence is the intent of the chapter; it sanctions reasonable and appropriate use only after protection of the resources.

Page 9:

NOTED 1. "Integrate...montimber resources...into management of timber resource." This implies that the timber resource is the first priority. There are certainly many instances where the timber resource (the harvesting or 'mining' of trees) is not the best and highest use of the resource.

2. "Contribute to...viability of...forest...industry." We really don't feel this is an appropriate goal. It is all too easy to place industry before the mandate to conserve and enhance the natural resources. DNR should be concerned with contributing to the viability of the people and the resources (not industry) first and foremost.

3. "Promote...continuing...renewable resources." This should be on the basis of a sustained yield for all resources, not only those for which DNR feels it has direct jurisdiction.

Page 10:

NOTED 1. "Contribute to...potential of the oil and gas industry." The business of the state government and its subdivisions should be people not business or industry.

Page 25

P25 1. What is a pre-existing road? What is its relationship to an existing road?

Page 27:

P27 1. "Half...acreage...rehabilitated...upon completion...." This means that from 2 to 8 acres per section will not be rehabilitated. This cannot be called enhancement (see goals) especially when unrehabilitated land could really be a mess and contain all the garbage (such as toxic, caustic or acidic additives) from the other so-called rehabilitated land. Such areas are certainly inappropriate in Wilderness Areas, Parks, wetlands, etc. No mention is made of rehabilitating the potential minimum additional acreage (13 acres per section) for roads, pipelines and other functions.

E70 2. "...to a pump installed in a stream...." A maximum GPM withdrawal of stream water should be determined with the Game Department and others to protect downstream and instream impacts on a case by case basis.

Page 31:

P45 1. The use of toxic, caustic or acidic additives in drill mud should be specified
E123 and individual impacts be enumerated in an EIS. Controls and mitigation should also be addressed.

Page 35:

P7 1. Who determines presence and levels of toxic materials in drilling fluids? Is monitoring required?

NOTED 2. Where are the D.O.E. approved disposal sites?

P27 3. "The drill pad surface...reserve mud pit, is restored to its original condition.... This statement is at odds with comment P27. "That only half the acreage would be rehabilitated." All is our goal.

E86 4. "Access roads are reclaimed as required by DNR." What are these requirements?

P55 5. "...equipment are removed and the surface is restored." Is there a site inspection to ensure compliance? Are bonds required to ensure compliance?

Page 42:

NOTED 1. "Lease applications...accepted...tracts...no adverse impacts...." This is a very positive statement and a highly desirable policy. We feel that the public should have the opportunity to comment on any such individual lease proposal.

P45 2. We feel the following lands should not be available for exploration or exploitation by any direct vertical drilling. Directional drilling should be addressed on a case by case basis with public comments via specific EIS:

Parks--city, county, state, national; wilderness areas; zones deisgnated Conservancy; natural area preserves; environmentally sensitive areas; wetlands; all areas set aside for a specific purpose (i.e., the Tumwater Botanical Area near Leavenworth.); shorelines of statewide significance; shorelines.

P7 3. "...to permit any activity...require...environmental checklist...." This checklist and mitigating measures should be subject to public review and comment.

Page 44:

P58,5 1. "Some preliminary investigations...." Some should be defined.

Page 45:

NOTED 1. "Public hearings may also be used to gather....information." Change may to will.

Page 46:

NOTED 1. "Industrial or domestic watersheds...." What is the definition of "Industrial" watersheds? Locations?

NOTED 2. Definitions for stream types and their designations should be consistent throughout all state agencies: i.e., a Game Department Type 1 should be the same as a DNR Type 1.

Page 46 and 47:

E64 It is to be hoped that DNR will use existing personnel in other departments to evaluate esoteric elements such as determination of significant wildlife wintering areas, fisheries impacts, etc.

Page A-1 and A-2:

P7,A-1 A very quick examination of drilling mud materials indicates some rather toxic substances, ones which would cause considerable concern if they were to be near my aquifer. Are they "safe"?

PROPOSED OIL AND GAS LEASING PROGRAM: DRAFT ENVIRONMENTAL IMPACT STATEMENT

General:

My apologies to Msars. Ford and Vonheeder, but on the whole I found this document extremely hard to follow. It is poorly organized perhaps and could definitely use a better physical configuration. The whole tenor of the EIS is to favor business and neglects real conservation and enhancement. There are many inconsistencies and contradictions. For example, many listed alternates are, as stated, totally unreasonable options, yet some unreasonable options are handed off by stating that the alternates are unreasonable.

I firmly believe that the EIS is so loosely written that public monitoring of EIS standards and policies is impossible, also that the make up obstructs DNR monitoring too!

Specific:

P42 Page 9: "...proposes to allow...investigative...actions...." "...proposes to allow development and production." You are proposing to allow these activities regardless of location and consequences? We feel a condition should be made such as "...these activities will be allowed only if conditions of the EIS are met."

NOTED Page 11: "Anticipate and respond...oil and gas industry activities." "Contribute to the potential of the oil and gas industry." These statements, with many of the goals listed on Page 10, are designed to nuture business, which, if it is like the past, will be to the detriment of other natural resources, such as recreation (hiking, fishing), water and air. Such statements disregard other areas of the DNR mandate.

P42,43 Page 12: "All department...lands...available...oil and gas leasing...unless prohibited or restricted...." The prohibited or restricted lands should be listed in the EIS.Comprehensive public comment and evaluation of the proposed action cannot be made on this EIS without the listing. The alternate which best covers all elements of your goals and policies is as follows:

Department managed lands will be placed in one of three categories. Oil and gas leasing will be based on each tract's category. They are:

Category I. Same as your Alternate 2 Category I.

Category II. Lands withheld from leasing. Tracts within prohibited areas.

Category III. Same as your Alternate 2 Category III.

P43 Page 16: Proposed Action. It is assumed this page addresses WHEN. The proposed action does not address, except in the most general terms, when notification will take place unless upon acceptance means instantaneously. It also does not address conditions where the surface is leased to private interests. Nor is the mechanism of public involvement outlined. Under Discussion it is stated "Notification upon receipt of the application is too early...to serve...useful purpose." In the last paragraph a very useful purpose is stated; early public involvement.

A possible scenario under the Proposed Action: The first notice of impending oil exploration or exploitation upon a Game Department Sanctuary is when the trucks come rumbling to their field office (if indeed there is one there.) Impossible? Your Proposed Action states "Notification to surface owners...." If the Game Department does not own the land there is no obligation to notify them, or any other surface users, if that user does not own the land. If DNR owns the land "leased" by the Game Department, your proposed action states that you will notify the DNR (the owners). Notification to all users (surface or not) must be required by all alternatives. The use of computers makes this quite feasible.

NOTED Page 18: Right of Entry. Proposed Action. The appropriate department must be identified. Is it the DNR office or the lessees office?

NOTED Under alternative it is stated that a no-action alternative would ignore the rights of surface leasees and is thus considered unreasonable. "Unreasonable"alternates have been listed throughout this document. The rights of surface leasers have been ignored in the Notification Section, among others. The rights of other natural resources are ignored.

NOTED Page 19: Resource Protection. Plants and Animals. Proposed Action. Wording must include "avoid impacts on Washington State Special Animal and Plant Species and animal and plant species listed as threatened, endangered or sensitive by agencies of the government of the State of Washington, the Federal Government, and local governments."

The value of your proposed action cannot be determined without expounding on what the statement "within trust management obligations...." means.

NOTED Page 20: Yes, it is possible that consideration of endangered, threatened and sensitive species would be costly and require dramatic changes. It is also possible that restrictions imposed by these considerations may not be warranted. The value of wildlife and the cost of its protection is not addressed by this document, nor is it its purpose. To be considered as relevant, your statements need more than mere enumeration.

P45 Page 20: Natural Area Preserves and the Registry Program. Mere deisgnation means little if these areas are not protected. There is no more protection of these areas by this EIS than to other areas. The location of oil and gas leasing activities must be adjusted if the area has been identified, otherwise identification serves no purpose but to build empires.

P45 Page 21. Cultural Resources. Proposed Action. "Administer the Oil and Gas Leasing Program in a manner...." This manner is not specified. What is the manner? Under Alternative "Make no special effort...." This implies that a special effort will be made under the Proposed Action. Where is this special effort documented? Is this effort as costly as the disregarded costly inventory and data gathering required to protect Plants and Animals discussed on Page 20?

NOTED "Since OAHP is understaffed and underfunded...." Is DNR going to increase their staffing to do this job (proposed action) or will DNR transfer funds to OAHP so that they may do the job?

We feel that special efforts must be made to protect all of our natural resources. One of your mandates is to enhance and conserve our natural resources. DNR is in itself a special effort to do that, and as such they should espouse using special efforts to achieve that mandate.

NOTED Road Construction. Proposed Action. The Forest Practices Board road standards should be enumerated. Current road construction and maintenance practices do not always contribute to solving problems, in fact they are problems. DNR is by its proposed action denying itself the right to more stringent and sensitive evaluation. A standards provides only a basis of evaluating and does not assure unbiased assessment of operator performance.

Both the Proposed Action and the alternate is silent about who establishes the standards and their applications. The criteria for standards are not stated for either proposal.

P45,50, 51 Page 22: Preliminary Investigations. Proposed Action. What are the preliminary investigations which will be allowed? What are the site-specific conditions which may dictate restrictions? What are the preliminary investigations which will be prohibited on water and wetlands? An evaluation of and comments on this EIS cannot be truly made without certain withheld information.

P45 Page 23. Seismic Exploration. Proposed Action. "...site-specific conditions may preclude...." Again certain valuable and necessary information is withheld. Under your discussion section the second paragraph is more of a dogmatic statement, and undocumented, than an element of an unbiased discussion.

NOTED Page 24: Stratigraphic and Exploratory Drilling. Discussion. Submission of an environmental checklist and a Plan of Operations for department approval will not ensure that an environmental analysis of the site has been made. Is not the checklist made by the applicant? The checklists we are familiar with have been. They have been biased and inaccurate. They have contained outright lies in opposition to differences of opinion. The lead agencies reviewing checklists must be as knowledgeable about the site (more so would be better) ~~than~~ as the lessee.

E25 The last paragraph states: "These alternatives would call for making a judgment about the relative importance of environmental impacts." The implications is that this is undesirable, yet the whole EIS is filled with judgments. Why single this out? If judgments are out of place here, they are out of place in all areas of the EIS. Please rewrite.

NOTED Page 34: Department Leasing Policies. "Since leasing is strictly an administrative process in which no environmental impacts occur, no mitigative measures are discussed." The lease itself (the paper, the document) is an administrative action and does not have an impact, but the results of the lease may very well have impacts.

NOTED Page 38: Resource Protection. Proposed Action. "Consider avoiding...impacts on species considered sensitive." Only consider? This must read "...must avoid...." To meet your goals and objectives you must avoid impacts. Alternate 2 is the preferred action.

Natural Environment. Earth, Air, Water. "No significant impacts are anticipated." This is an area where the document's organization may well have went to pot. I cannot tell what policy this refers to. To say leasing will not have an impact is ridiculous. See Deer Creek Mud Slide for potential caused by poor Forest management practices and road construction practices; while they may not have been related to oil and gas leasing activities the potential is there!

NOTED Page 39: Energy and Natural Resources. "No significant impacts are anticipated." Here again this fiasco may well be the result of poor differentiation. Significant impacts to energy resources will result from removal of gas and oil. The activities to exploit these may very well impact other natural resources--the ones which seem to be shunted away, i.e. water, recreation, wildlife, etc.

E43,86 Page 42: Natural Environment. Earth. "Cut and fill...may...result in changes...." By definition cut and fill does change the topography. "Overall impacts to topography associated with road building would be minor and insignificant." Wrong! It should read major and significant. See Dear Creek Slide and other disasters caused by poor road construction practices.

E43 What is pre-existing natural topography. Nowhere does there appear requirements in mitigation for culverts, reseeding, catch basins, etc.

E64,75 Air. What are the dust abatement measures? Are they chemical? Mechanical? Construction only after rains or snow?

NOTED Page 43: Plants and Animals. "...review...will...(use) the Natural Heritage data system...to identify...." "The appropriate Department of Game...may...." All resources must be used as well as an unspecified Natural Heritage data system must be used. May be used. This should read must be used.

The construction of roads is not a good reason to destroy or impact Washington State Special Animal or Plant Species. Construction neither enhances or conserves.

P45 Page 43: Noise. Noise in remote areas can be a significant impact to both wildlife and humans using those areas. Another option would be to restrict construction to week days only.

E86 Page 44: "Roads may be barricaded and abandoned at the close of operations." This appears to be a new option. What happened to rehabilitation?

NOTED Page 50 and 51: Figure 4's dimensions do not match word description of the second paragraph on page 50. Page 50 also contains a value judgment.

NOTED Page 52: I cannot find the referenced alternate to M/T. A value judgment is also contained in the next to last paragraph.

E55 Page 53: The mitigation should read "Entry to sensitive areas will be denied,..."

The last paragraph uses a proposed goal of the Proposed Aquatic Policy Plan as justification for a no-action alternative. Such usage is underhanded, for or against an activity. Incidentally this no-action alternate seems to be missing.

E58,62, 66 Page 54: Seismic Exploration. "Energy would be induced...." What kind of energy? What is the magnitude? What are the time frames? What are the site-specific conditions which may preclude the use of certain (what kind) energy; limit (specify); or modify (how?) their use?

E58 Page 56: Liquification of soils other than clays also occur.

E59 Page 57: Who are the "local planning authorities" suggested for developing Plan of Operations for unstable soils? I do not see the preferred action or the alternates!

E59 I suspect (hope!) the phrase minimum corridor widths should read maximum corridor widths. See Mitigation for Plants and Animals.

Because of time limitations we could not finish our evaluation beyond page 57. Based on the previous pages it is expected that the following pages would result in similar comments.

Thank you for the opportunity to comment.

Sincerely,

Curtiss E. Howard
President
Pilchuck Audubon Society

Letters from Companies

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Boise Cascade

January 3, 1985

W19

Mr. Kenneth Solt
Division Manager
Lands Division
Department of Natural Resources
Mail Stop QW-21
Olympia, WA 98504

Subject: Proposed Oil and Gas Leasing Program
Draft Programmatic Environmental Impact Statement

Dear Mr. Solt:

Boise Cascade Corporation appreciates the opportunity to comment on the proposed Oil and Gas Leasing Program and the Draft Programmatic Environmental Impact Statement (PEIS). Boise Cascade's review of both documents found them to be well written and complete. It was noted, however, that
NOTED the section entitled "Oil and Gas Leasing Procedure" appeared at the end of the document. Clearly, this discussion of leasing procedure, and especially Table 4 which depicts permit processing, should appear at the forefront of this document. Further, the flow chart presented in Table 4 is not accompanied by a detailed description.

Boise Cascade timberlands, very often, cannot be fully evaluated without geologic interpretations gained from adjacent DNR-managed lands. Therefore, Boise Cascade supports the DNR's Oil and Gas Leasing Program goals.

Again, thank you for this opportunity to comment on these important documents.

Sincerely,

Victor J. Kollock

Victor J. Kollock
Environmental Engineer

VJK/A5.15f